CHESAPEAKE BAY TMDL ACTION PLAN

(2013-2018 MS4 General Permit)

A Plan for Achieving a 5% Reduction of Existing Loads

June 30, 2015

This plan satisfies the requirements of Section I(C) of the MS4 General Permit (9VAC25-890-40) for Special Conditions for the Chesapeake Bay TMDL. This plan is consistent with the Chesapeake Bay TMDL and the Virginia Phase I and II WIPs to meet the Level 2 (L2) scoping run for existing developed lands as it represents an implementation of 5.0% of L2 as specified in the 2010 Phase I WIP.

Northern Virginia Community College

Alexandria Campus

Annandale Campus

Loudoun Campus

Woodbridge Campus

EEE Consulting, Inc.

EXECUTIVE SUMMARY

Northern Virginia Community College (NVCC), is authorized to discharge stormwater from its municipal separate storm sewer system (MS4) under the Virginia Pollutant Discharge Elimination System (VPDES) General Permit for Discharge of Stormwater from Small MS4s (MS4 General Permit). To maintain permit compliance, NVCC implements an MS4 Program Plan that includes best management practices (BMPs) to address six minimum control measures (MCMs) and special conditions for the Total Maximum Daily Load (TMDL) in which NVCC has been assigned a wasteload allocation (WLA). The Environmental Protection Agency (EPA) describes a TMDL as a "pollution diet" that identifies the maximum amount of a pollutant the waterway can receive and still meet water quality standards. A WLA determines the required reduction in pollutant of concern loadings from the MS4s to meet water quality standards. The MS4 General Permit serves as the regulatory mechanism for addressing the load reductions described in the TMDL, predominantly through the requirement of a TMDL Action Plan.

The Chesapeake Bay TMDL was established by the EPA on December 29, 2010 and initiated WLAs for phosphorus, nitrogen and total suspended solids. In response, the Commonwealth of Virginia developed Watershed Implementation Plans (WIPs) that, in part, identify the MS4 General Permit as a mechanism for enforcing load reductions in urban areas. Subsequently, the Commonwealth included special conditions into the latest MS4 General Permit to address the reductions required by the TMDL for the pollutants of concern. The WIPs intended the reductions to be achieved over the course of three 5-year permit cycles, with the first cycle (2013 – 2018) requiring 5% of the reductions be achieved. Reduction requirements for the following two permit cycles are anticipated to increase substantially, requiring an additional 35% and 60% of the reductions be achieved, respectively.

NVCC has developed an Action Plan consistent with the Chesapeake Bay Action Plan Guidance Memo (Memo No. 15-2005) provided by the Virginia Department of Environmental Quality (DEQ). The guidance was used to determine the required pollutant load reductions and identify the means and methods for achieving 5% of the reductions required by the current MS4 General Permit. A review of NVCC's existing stormwater management facilities identified applicable pollutant reduction credits from five facilities: (1) a bioretention facility on the Alexandria campus, (2) two bioretention facilities and a Filterra structure on the Loudoun campus and (3) a retention basin also on the Loudoun campus. The pollutant reduction credit available with these facilities exceeds the required reductions for the permit cycle. Continued inspection and maintenance of these facilities to ensure functionality, along with continued implementation of the NVCC MS4 Program Plan is consistent with the provisions of an iterative MS4 Program, which constitutes compliance with the MS4 General Permit standard of reducing pollutants to the maximum extent practicable.

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Acronyms

BMP	Best Management Practice
CGP	Construction General Permit
CUA	Census Urban Area
CWA	Clean Water Act
DEQ	Virginia Department of Environmental Quality
EOS	Edge of Stream
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
GIS	Geographic Information System
IDDE	Illicit Discharge Detection and Elimination
LA	Load Allocation
L2	Level 2
MCM	Minimum Control Measure
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
MS4 GP	General Permit for Discharge of Stormwater from Small MS4s
NMP	Nutrient Management Plan
NVCC	Northern Virginia Community College
POC	Pollutant of Concern
RLDA	Regulated Land Disturbing Activity
SWPPP	Stormwater Pollution Prevention Plan
SWM	Stormwater Management
TMDL	Total Maximum Daily Load
VAC	Virginia Administrative Code
VCCS	Virginia Community College System
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WIP	Watershed Implementation Plan
WLA	Wasteload Allocation

Definitions

Best Management Practices (BMPs) are schedules of activities, prohibitions of practices, maintenance procedures, and other management practices, including both structural and nonstructural practices, to prevent or reduce the pollution of surface waters and groundwater systems.

Census Urbanized Area (CUA) are areas identified as urban. MS4 regulations only apply within CUAs.

Existing Sources are pervious and impervious urban land uses served by the MS4 as of June 30, 2009.

Impervious Cover is a surface composed of material that significantly impedes or prevents natural infiltration of water into soil.

L2 Scoping Run is a model run to determine required reductions from urban sources as of June 30, 2009. The L2 reductions are summarized in the following table:

Pollutant of Concern	Regulated Impervious (%)	Regulated Pervious (%)
Nitrogen	9	6
Phosphorus	16	7.25
Sediment	20	8.75

Municipal Separate Storm Sewer System (MS4) is a conveyance or system of conveyances otherwise known as a municipal separate storm sewer system (MS4), including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains that are:

- Owned or operated by a federal state, city, town, county, district, association, or other public body, created by or pursuant to state law that discharges to surface waters;
- Designed or used for collecting or conveying stormwater;
- That is not a combined sewer; and
- That is not part of a publicly owned treatment works.

New Sources are pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009.

NCVV MS4 Program Plan is the guiding document of the NVCC's MS4 Program and includes best management practices to address conditions of the MS4 General Permit.

Pollutants of Concern (POC) are total nitrogen ("TN"), total phosphorus ("TP"), and total suspended solids ("TSS").

Prior Developed Lands are land that has been previously utilized for residential, commercial, industrial, institutional, recreation, transportation, or utility facilities or structures, and that will have the impervious areas associated with those uses altered during a land-disturbing activity.

Transitional Sources are regulated land disturbing activities that are temporary in nature and discharge through the MS4.

1.0 INTRODUCTION AND PURPOSE

Mandated by Congress under the Clean Water Act (CWA), the National Pollutant Discharge Elimination System (NPDES) storm water program includes the Municipal Separate Storm Sewer System (MS4), Construction, and Industrial General Permits. In Virginia the NPDES Program is administered by the Department of Environmental Quality (DEQ) through the Virginia Stormwater Management Program (VSMP) and the Virginia Pollutant Discharge Elimination System (VPDES). Northern Virginia Community College (NVCC) is authorized to discharge stormwater from its MS4 under the VPDES General Permit for Discharge of Stormwater from Small MS4s (MS4 General Permit). As part of the MS4 General Permit authorization, NVCC developed and implements a MS4 Program Plan (the Plan) with best management practices (BMPs) to address the six minimum control measures (MCMs) and the special conditions for applicable total maximum daily loads (TMDLs) outlined in the MS4 General Permit. Implementation of these BMPs is consistent with the provisions of an iterative MS4 Program, which constitutes compliance with the standard of reducing pollutants to the "maximum extent practicable" or MEP.

"NVCC's MS4 program strives to improve environmental compliance, quality and stewardship through effective management, implementation, and enforcement."

The NVCC MS4 program strives to improve environmental compliance, quality and stewardship through effective management, implementation, and enforcement of sound technical guidelines, criteria and practices for stormwater management and erosion and sediment control. The plan presented herein demonstrates how NVCC's MS4 Program Plan addresses sediment and nutrients (nitrogen and phosphorus) in its MS4 regulated area consistent with the requirements of the Chesapeake Bay TMDL.

1.1 Total Maximum Daily Loads

A TMDL is the total amount of a given pollutant that a waterbody can assimilate and still meet water quality standards. Typically, TMDLs are represented numerically in three main components: Waste Load Allocations (WLAs), a Load Allocation (LA), and a Margin of Safety. A WLA is the allocated amount of pollutant from areas discharging through a pipe or other conveyance considered a point source. Point sources include sewage treatment plants, industrial facilities and storm sewer systems. In contrast, an LA is the amount of pollutant from existing non-point sources and natural background such as farm runoff and atmospheric deposition. As a point source discharge, MS4's are assigned a WLA representing the annual loading of the pollutant of concern (POC) that can be discharged from its regulated MS4 area.

1.2 MS4 General Permit Special Conditions

NVCC's MS4 General Permit includes a series of special conditions that must be addressed for MS4 General Permit compliance where NVCC has been assigned a WLA under the TMDL. The special conditions state that any TMDL approved by the State Water Control Board (SWCB) assigning a WLA to an MS4 must be addressed by the Permittee through the measurable goals of their MS4 Program Plan.

In 1998, large portions of Chesapeake Bay and its tidal tributaries within Virginia were identified as not meeting water quality standards and listed as impaired because of excess nitrogen, phosphorus and sediment. Due to the Chesapeake Bay waters remaining on the impaired waters list, the Environmental Protection Agency (EPA) required that a TMDL be developed, which was issued on December 29, 2010.

1.3 Watershed Implementation Plan and Strategy for MS4s

The Chesapeake Bay Watershed Implementation Plans (WIPs) are plans that detail how and when the six Chesapeake Bay states and the District of Columbia will meet pollutant allocations. In the Phase I and Phase II WIPs for the Chesapeake Bay TMDL, Virginia committed to a phased approach to reducing nutrients and suspended solids discharging from MS4s. The issuance of the 2013-2018 MS4 General Permit set forth special conditions required by all MS4 General Permit holders to meet the immediate goals of Virginia's approach to the Chesapeake Bay TMDL that include a 5% reduction in existing baseline loads (defined as loads as of June 20, 2009) by July 1, 2018.

1.4 NVCC Chesapeake Bay Action Plan

The NVCC Action plan presented herein provides a review of the current MS4 program, which demonstrates NVCC's ability to ensure compliance with the special conditions and includes the means and methods NVCC will use to meet 5.0% of the Level 2 (L2) scoping run reduction for existing development during the first MS4 General Permit cycle. This Action Plan was developed to comply with the regulations of the MS4 General Permit (9VAC25-890) and under the advisement of DEQ's Guidance Memo No. 15-2005, which provides background information and procedures to meet the Chesapeake Bay TMDL special condition requirements.

2.0 APPLICABLE OVERVIEW OF NVCC'S MS4 PROGRAM

NVCC's MS4 Permit covers stormwater discharges from areas included within census urbanized areas (CUAs). NVCC campuses included in CUAs include the Alexandria, Annandale, Loudoun and Woodbridge campuses, as depicted in Appendix A. NVCC's collective efforts, as described in the NVCC MS4 Program Plan, result in significant reduction of pollutants that may be discharged from its regulated MS4. BMPs already included in the NVCC Program Plan that address sediment and nutrients impairing the Chesapeake are described in the following sections. Each subsection is provided to address the referenced special condition in the MS4 General Permit.

2.1 Current Program and Existing Legal Authority

As a non-traditional MS4, NVCC does not have the ability to create legal authorities and has not identified any necessary legal authorities necessary to meet the requirements of the special conditions. However, NVCC's MS4 Program includes Minimum Control Measures (MCMs) that include policies and procedures consistent the goals of the Chesapeake Bay TMDL. A summary of the applicable MCMs is listed below to address the following special condition:

- ✓ *"A review of the current MS4 program implemented as a requirement of this state permit including a review of the existing legal authorities and the operator's ability to ensure compliance with this special condition."* [Section I(C)(2)(a)(1)]

- *MCM 1 (Public Education and Outreach)* – NVCC's MS4 Program includes a Public Education and Outreach Program (PEOP) that identifies the Chesapeake Bay TMDL pollutants of concern (POCs) as a high priority water quality issue. The PEOP is described in BMP 1.2 of the NVCC MS4 Program Plan and includes the distribution of educational materials regarding methods to reduce introduction of the POCs into stormwater runoff.

- *MCM 3 (Illicit Discharge Detection and Elimination)* – NVCC's MS4 Program includes an Illicit Discharge Detection and Elimination (IDDE) Program that includes written procedures to detect, identify, and address non-stormwater discharges, including illegal dumping, to the small MS4 with policies and procedures for when and how to use legal authorities. NVCC prohibits non-stormwater discharges into the storm sewer system through language provided within the Standards of Conduct for employees and the Student Handbook for students. IDDE BMPs are described in the Minimum Control Measure 3 BMPs in the NVCC MS4 Program Plan. The IDDE Program is effective at addressing the POC through staff training, prohibition of illicit discharges, and annual outfall screening.

- *MCM 4 (Construction Site Runoff Control)* – NVCC's MS4 Program includes a Construction Site Runoff Control Program that includes mechanisms to ensure compliance and enforcement on regulated construction sites with implementation of the DEQ-approved "*VCCS Annual Erosion and Sediment Control and Stormwater Management Standards and Specifications."*

The standards and specifications are consistent with the Virginia Erosion and Sediment Control and Stormwater Management Laws and Regulations and includes:

- Required plan approval prior to commencement of a regulated land disturbance activity;
- Construction site inspections and enforcement; and
- Certification of post-construction stormwater management facilities.

The Construction Site Runoff Control Program is especially effective at reducing downstream conveyance of sediment from transitional sources. Minimum Control Measure 4 BMPs in the NVCC MS4 Program Plan describe construction site runoff control BMPs.

- *MCM 5 (Post-Construction Stormwater Management)* – NVCC's MS4 Program includes a Post-Construction SWM Program that ensures water quality criteria in the Virginia Stormwater Management Regulations has been achieved on new developments and developments on prior developed land since July 1, 2009. Post-construction, the Program ensures long-term inspections and maintenance of stormwater management BMPs. Included among these requirements are written policies and procedures in the VCCS Erosion and Sediment Control and Stormwater Management Standards and Specifications to ensure that stormwater management facilities are designed and installed in accordance with appropriate law and regulations. Minimum Control Measure 5 BMPs in the NVCC MS4 Program Plan describe post-construction stormwater management BMPs.

  Implementation of this program addresses the following MS4 General Permit special conditions for the Action Plan to include:

  - ✓ *"The means and methods that will be utilized to address discharges into the MS4 from new sources* [*Section I(C)(2)(a)(3)*]

- *MCM 6 (Good Housekeeping)* – NVCC's MS4 Program includes a Pollution Prevention/Good Housekeeping Program that includes policies and procedures to ensure that day-to-day operations minimize the exposure of pollutants to rainfall on campus grounds to the maximum extent practicable. The program is supported with NVCC's Pollution Prevention & Good Housekeeping Manual and annual training for applicable staff. NVCC also utilizes contract language to ensure appropriate certifications for application of fertilizers per a DEQ-approved Nutrient Management Plan. Minimum Control Measure 6 BMPs in the NVCC MS4 Program Plan describe pollution prevention and good housekeeping BMPs.

2.2 New or Modified Legal Authorities

Consistent with the MS4 General Permit, NVCC uses an iterative approach to ensure the College is minimizing the discharge of pollutants through its MS4 to the MEP. The iterative approach is

implemented through the annual reporting process with the review of the effectiveness of each MS4 Program Plan BMP. BMPs are modified, as necessary, to increase effectiveness. If new or modified authorities are identified with the measure of effectiveness as described in the NVCC MS4 Program Plan annual reporting, they will be reported through the annual report process. The iterative process addresses the following special condition in the MS4 General Permit:

- ✓ *"The identification of any new or modified legal authorities such as ordinances, state and other permits, orders, specific contract language, and inter-jurisdictional agreements implemented or needing to be implemented to meet the requirements of this special condition."* [Section I(C)(2)(a)(2)]

As a non-traditional MS4, NVCC does not have the legal authority to create legal authorities. NVCC has not identified any necessary legal authorities necessary to meet the requirements of the special conditions. Means and methods to meet the special conditions are described in Section 4.

3.0 POLLUTANT LOADINGS

The MS4 General Permit requires NVCC to estimate the annual loadings and the necessary 5.0% reductions from the L2 Scoping Run POC reductions for existing sources as of June 30, 2009. To complete this requirement, NVCC determined the amount of pervious and impervious land cover for each applicable campus and input the data into the appropriate loading and reduction tables provided in the MS4 General Permit. The methodology to determine sediment and nutrient loadings and the required reductions are described in the following sub-sections.

3.1 Baseline Loading Characterization

Before estimating the loads and required reductions, NVCC first evaluated the extent of their regulated MS4 area, including the regulated acres of urban pervious and impervious surface served by its MS4 as of June 30, 2009. These evaluations were conducted using Geographic Information System (GIS) digitization utilizing aerial photography, as depicted in Appendix A.

NVCC's MS4 regulated area was calculated using the NVCC property boundaries as a conservative estimate of the areas the MS4 serves. Campus boundaries were obtained from City of Alexandria, Fairfax County, Loudoun County, and Prince William County GIS data, for each respective regulated campus. Aerial photography was obtained from the 2009 Virginia Base Map Program Orthophotography Program Aerials[1]. The extent of pervious, impervious and forest areas were digitized based on the aerial imagery and best professional judgment. For areas that were under construction or disturbed in the 2009 aerial imagery, current aerial images were used to determine whether the areas resulted in pervious or impervious surfaces after construction. Baseline land cover results are provided in Table 1. The determination of regulated area was based on the 2010 CUA.

Table 1: Classification of Campus Land Cover Area (Acres)

Land Cover	Alexandria Campus	Annandale Campus	Loudoun Campus	Woodbridge Campus
Impervious	23.3	44.1	18.6	16.9
Pervious	12.6	16.5	65.9	15.3
Forest*	17.8	12.6	7.1	68.5
Surface Water*	0.0	2.6	1.5	4.7

* Consistent with methodology described in the DEQ Chesapeake Bay Guidance, these areas are not included in the loading computations described in Section 3.2.

3.2 Annual Loadings from Existing Sources

The data summarized in Table 1 was used to estimate pollutant loads from existing sources as of June 30, 2009, using the Potomac River Basin calculation sheet for estimating existing source

[1] Virginia Base Map Program Orthophotography Program, 2009. http://www.vita.virginia.gov/isp/default.aspx?id=8412

loads provided in the MS4 General Permit. The calculation sheet was completed for each regulated NVCC campus as provided in Tables 2 - 5 which address the following special condition:

- ✓ *"An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the 2009 progress run. The operator shall utilize the applicable versions of Tables … based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 Edge of Stream (EOS) loading rate."* [*Section I(C)(2)(a)(4)*]

Table 2: Loadings from the Alexandria Campus

Pollutant	Regulated Urban Land Cover	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run (lbs)	Total Load (lbs)
Nitrogen	Impervious Pervious	23.3 12.6	16.86 10.07	392.84 126.88	519.72
Phosphorus	Impervious Pervious	23.3 12.6	1.62 0.41	37.75 5.17	42.92
TSS	Impervious Pervious	23.3 12.6	1,171.32 175.8	27,291.76 2,215.08	29,506.84

Table 3: Loading from the Annandale Campus

Pollutant	Regulated Urban Land Cover	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run (lbs)	Total Load (lbs)
Nitrogen	Impervious Pervious	44.1 16.5	16.86 10.07	743.53 166.16	909.69
Phosphorus	Impervious Pervious	44.1 16.5	1.62 0.41	71.44 6.77	78.21
TSS	Impervious Pervious	44.1 16.5	1,171.32 175.8	51,655.21 2,900.70	54,555.91

Table 4: Loading from the Loudoun Campus

Pollutant	Regulated Urban Land Cover	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run (lbs)	Total Load (lbs)
Nitrogen	Impervious Pervious	18.6 65.9	16.86 10.07	313.60 663.61	977.21
Phosphorus	Impervious Pervious	18.6 65.9	1.62 0.41	30.13 27.02	57.15
TSS	Impervious Pervious	18.6 65.9	1,171.32 175.8	21,786.55 11,585.22	33,371.77

Table 5: Loading from the Woodbridge Campus

Pollutant	Regulated Urban Land Cover	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run (lbs)	Total Load (lbs)
Nitrogen	Impervious	16.9	16.86	284.93	439.01
	Pervious	15.3	10.07	154.07	
Phosphorus	Impervious	16.9	1.62	27.38	33.65
	Pervious	15.3	0.41	6.27	
TSS	Impervious	16.9	1,171.32	19,795.31	22,485.05
	Pervious	15.3	175.8	2,689.74	

3.3 Annual Loadings from New Sources and Grandfathered Projects

In addition to computing baseline loadings from existing conditions as of June 30, 2009, the special conditions require the determination of offsets for increased loads from development occurring on or after July 1, 2009, including grandfathered projects. No offsets are necessary for new sources since:

- Loadings from new sources are addressed with the water quality criteria in the stormwater management regulations. Water quality criteria for new sources from regulated development between July 1, 2009 and June 30, 2014 was based on an average land cover condition of 16% and therefore appropriate offsets were incorporated within the development project's stormwater management plan.
- No NVCC projects are grandfathered.

Since no offsets for new sources are necessary, the following special conditions are addressed:

- ✓ *"A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48"* [*Section I(C)(2)(a)(10)*]
- ✓ *"The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2014, that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The operator shall offset 5.0% of the calculated increased load from these new sources during the permit cycle."* [Section I(C)(2)(a)(7)]
- ✓ *"The means and methods to offset the increased loads from projects as grandfathered in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014, where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities."* [Section I(C)(2)(a)(8)]
- ✓ *"Implementation of the means and methods to address discharges from new sources in accordance with the minimum control measure in Section II … related to post-construction stormwater management in new development and development of prior developed lands and in order to offset 5.0% of the total increase in POC loads between July 1, 2009, and June 30, 2014. Increases in the POC load from grandfathered projects initiating construction after July 1, 2014, must be offset prior to completion of the project."* [Section I(C)(3)(c)]

3.4 Required Load Reductions

The MS4 General Permit requires NVCC to reduce 5.0% of the L2 Scoping Run POC reductions for existing sources as of June 30, 2009. The required load reductions for all four campuses for this permit cycle were calculated using the calculation sheet in the MS4 General Permit for determining POC reductions for the Potomac River basin. The calculation sheets were modified with the corrected loading rates provided in DEQ's Guidance Memo No. 15-2005. The required load reductions for each campus are depicted in Tables 6 - 9. Since each regulated campus is in the Potomac Basin, reductions are not campus-specific and therefore summarized in Table 10. The information in the tables addresses the following special condition to provide:

- ✓ *"A determination of the total pollutant load reductions necessary to reduce the annual POC loads from existing sources utilizing the applicable versions of Tables … based on the river basin to which the MS4 discharges. This shall be calculated by multiplying the total existing acres served by the MS4 by the first permit cycle required reduction in loading rate. For the purposes of this determination, the operator shall utilize those existing acres identified by the 2000 U.S. Census Bureau urbanized area and served by the MS4."* [*Section I(C)(2)(a)(5)*]

Table 6: Estimated POC Reductions from the Alexandria Campus

Pollutant	Regulated Urban Land Cover	Existing Acres Served by MS4 (06/30/09)	Reduction in Loading Rate (lbs/acre)	Reduction Required First Permit Cycle (lbs)	Total Reduction (lbs)
Nitrogen	Impervious	23.3	0.07587	1.77	2.15
	Pervious	12.6	0.03021	0.38	
Phosphorus	Impervious	23.3	0.01296	0.30	0.32
	Pervious	12.6	0.00148625	0.02	
TSS	Impervious	23.3	11.7132	272.92	282.61
		12.6	0.769125	9.69	

Table 7: Estimated POC Reductions from the Annandale Campus

Pollutant	Regulated Urban Land Cover	Existing Acres Served by MS4 (06/30/09)	Reduction in Loading Rate (lbs/acre)	Reduction Required First Permit Cycle (lbs)	Total Reduction (lbs)
Nitrogen	Impervious	44.1	0.07587	3.35	3.84
	Pervious	16.5	0.03021	0.50	
Phosphorus	Impervious	44.1	0.01296	0.57	0.60
	Pervious	16.5	0.00148625	0.02	
TSS	Impervious	44.1	11.7132	516.55	529.24
		16.5	0.769125	12.69	

Table 8: Estimated POC Reductions from the Loudoun Campus

Pollutant	Regulated Urban Land Cover	Existing Acres Served by MS4 (06/30/09)	Reduction in Loading Rate (lbs/acre)	Reduction Required First Permit Cycle (lbs)	Total Reduction (lbs)
Nitrogen	Impervious	18.6	0.07587	1.41	3.40
	Pervious	65.9	0.03021	1.99	
Phosphorus	Impervious	18.6	0.01296	0.24	0.34
	Pervious	65.9	0.00148625	0.10	
TSS	Impervious	18.6	11.7132	217.87	268.55
		65.9	0.769125	50.69	

Table 9: Estimated POC Reductions from the Woodbridge Campus

Pollutant	Regulated Urban Land Cover	Existing Acres Served by MS4 (06/30/09)	Reduction in Loading Rate (lbs/acre)	Reduction Required First Permit Cycle (lbs)	Total Reduction (lbs)
Nitrogen	Impervious	16.9	0.07587	1.28	1.74
	Pervious	15.3	0.03021	0.46	
Phosphorus	Impervious	16.9	0.01296	0.22	0.24
	Pervious	15.3	0.00148625	0.02	
TSS	Impervious	16.9	11.7132	197.95	209.72
		15.3	0.769125	11.77	

Table 10: Compiled POC Reductions from all NVCC Regulated Campuses

Pollutant	Alexandria Reduction (lbs)	Annandale Reduction (lbs)	Loudon Reduction (lbs)	Woodbridge Reduction (lbs)	Total Reduction Required (lbs)
Nitrogen	2.15	3.84	3.40	1.74	11.13
Phosphorus	0.32	0.60	0.34	0.24	1.50
TSS	282.61	529.24	268.55	209.72	1,290.12

4.0 MEANS TO ACHIEVE POLLUTANT REDUCTIONS

DEQ's Guidance Memo No. 15-2005 developed to assist MS4s with development of Chesapeake Bay Action Plans was used to identify appropriate means and methods for achieving the required reductions computed in Section 3.4. A review of NVCC's existing stormwater management facilities determined that the required reductions are achieved for the current MS4 General Permit cycle as described in the following sub-sections, addressing the following MS4 General Permit special condition:

- ✓ *"Implementation of means and methods sufficient to meet the required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan." [Section I(C)(3)(d)]*

Reduction credits described in this section demonstrate compliance with the reduction requirements for this MS4 General Permit cycle with the understanding that any changes in established BMP efficiencies will not be retroactively applied to projects approved to meet reductions for this MS4 General Permit cycle.

4.1 Reductions Achieved from Existing BMPs

Per Part IV.2 of DEQ's Guidance Memo No. 15-2005, NVCC may receive POC reduction credits for SWM BMPs initially installed on or after January 1, 2006 and prior to July 1, 2009. One BMP was identified to meet the criteria and is described as follows:

- In April 2009, a bioretention facility, as described in the Virginia Stormwater Management Handbook, was installed on the Alexandria campus as part of a plan completed by EYP Architecture & Engineering, P.C., entitled "Northern Virginia Community College New Construction Phase III Renovation Phase I & II." Consistent with the stormwater regulations water quality criteria at the time, design computations for the bioretention demonstrate phosphorus reductions based on a 16% land cover condition. In order to quantify the amount of nitrogen, phosphorus and sediment being removed by the bioretention facility, additional water quality calculations were conducted based on the Chesapeake Bay Program Retrofit Equations. Computations are provided in Appendix B and summarized in Table 11.

Table 11: Summary of POC Reductions from the 2009 Bioretention BMP

Pollutant	Load Reduction Provided by BMP (lbs/yr)
Nitrogen	7.49
Phosphorus	0.68
TSS	492.69

DEQ's Guidance Memo also allows POC reduction credit for SWM BMPs initially installed after June 30, 2009, provided that credit is only taken for reductions achieved in excess of the

reductions required by the SWM regulation water quality criteria for the development. A review of NVCC's BMPs identified the following facilities that provide POC reductions in excess of those necessary for the associated developments:

- In June 2011, two bioretention filters, as described in the Virginia Stormwater Management Handbook, and a Filterra structure were installed on the Loudoun campus as part of a plan completed by EYP Architecture & Engineering, P.C., titled "Northern Virginia Community College Loudoun Phase III North Parking Lot." Per the design plan, water quality compliance was achieved through implementation of two bioretention filters and a Filterra structure. The plan indicates that pollutant removal requirements for the parking lot development were met and exceeded by 0.06 pounds of phosphorus per year. Calculations to determine the proportional nitrogen and sediment reductions achieved were computed based on DEQ's Guidance Memo No. 15-2005 (Example V.E.1) and are included in Appendix B and summarized in Table 12.

Table 12: Summary of POC Reductions from the 2011 Bioretention and Filterra BMPs

Pollutant	Load Reduction Required for Associated Development (lbs/yr)	Load Reduction Provided (lbs/yr)	Remaining Credit (lbs/yr)
Nitrogen	N/A	21.61	0.39
Phosphorus	3.27	3.33	0.06
TSS	N/A	2,939	52.90

- In July 2012, a retention basin III, as described in the Virginia Stormwater Management Handbook, was installed on the Loudoun campus as part of a plan completed by EYP Architecture & Engineering, P.C., entitled "Northern Virginia Community College Loudoun Phase III." Water quality compliance was achieved utilizing the retention basin III BMP, referred to as "Pond 2" on the design plan, and two other existing BMPs installed prior to 2006. The design plan demonstrates that pollutant removal requirements were met and exceeded. In order to determine the amount of credit remaining specifically in the retention basin III BMP, additional water quality calculations were performed and included in Appendix B. The computations determined 1.88 pounds of phosphorus reduction per year is achieved in excess of what was required by the development. Calculations to determine the proportional nitrogen and sediment reductions achieved were computed based on DEQ's Guidance Memo No. 15-2005 (Example V.E.1) and are included in Appendix C and summarized in Table 13.

Table 13: Summary of POC Reductions from the 2012 Retention Basin III BMP

Pollutant	Load Reduction Required for Associated Development (lbs/yr)	Load Reduction Provided (lbs/yr)	Remaining Credit (lbs/yr)
Nitrogen	N/A	16.70	4.01
Phosphorus	5.99	7.87	1.88
TSS	N/A	3,406	817.53

The sum of the reductions achieved by the Alexandria campus bioretention and the remaining reductions achieved by the Loudoun campus bioretention filters, Filterra structure, and retention basin III BMPs exceed the required POC reductions identified in Section 3.4. Therefore, the existing BMPs serve as the means to meet the required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan. Required and provided reductions for NVCC are summarized in Table 14.

Table 14: Summary of POC Reductions from Existing BMPs to Achieve Required Reductions

Pollutant	Reductions Required by L2 Scoping Run (lbs/yr)	Reductions Provided By 2009 Bioretention (lbs/yr)	Remaining Reductions Provided By 2011 Bioretentions/Filterra (lbs/yr)	Remaining Reductions Provided By 2012 Retention Basin III (lbs/yr)	Total Reductions Provided By Existing BMPs (lbs/yr)
N	11.13	7.49	0.39	4.01	11.89
P	1.50	0.68	0.06	1.88	2.62
TSS	1,290.12	492.69	52.90	817.53	1,363.12

5.0 IMPLEMENTATION TO THE MEP

Implementation of the Action Plan is dependent on continued execution of the NVCC MS4 Program Plan. MS4 Program Plan BMPs will continue to be implemented per the schedules outlined in the NVCC MS4 Program Plan to address the following special condition:

- ✓ *"The means and methods, such as management practices and retrofit programs that will be utilized to meet the required reductions included in subdivision 2 a (5) of this subsection … and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting those reductions."* [Section I(C)(2)(a)(6)]

Since the Action Plan is supported with existing stormwater BMPs, all actions are presently incorporated into the financially supported implementation of NVCC's MS4 Program Plan. Therefore, an estimate of expected costs is considered neutral. This statement addresses the following special condition:

- ✓ *"An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle."* [Section I(C)(2)(a)(11)]

5.1 Means to Achieve the Waste Load Allocation

The existing BMPs described in Section 4.1 represent adequate progress for the current MS4 General Permit cycle (through July 1, 2018) towards achieving TMDL wasteload allocations consistent with the assumptions and requirements of the TMDL. NVCC will continue to implement the Post-Construction Stormwater Management Program described in Section 2.1 that includes inspections and maintenance, when necessary, of the college's stormwater management BMPs. Continued implementation of this program addresses the following special condition:

- ✓ *"Implementation of means and methods sufficient to meet the required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan."* [Section I(C)(3)(b)]

5.2 Supplemental Means and Methods

In addition, the remaining Minimum Control Measure BMPs described in Section 2.1 will continue to be implemented by NVCC as part of the NVCC MS4 Program Plan. Continued implementation of these BMPs demonstrates implementation of the NVCC Chesapeake Bay Action Plan to the maximum extent practicable and demonstrate adequate progress satisfying the following special conditions:

- ✓ *"Implementation of nutrient management plans ..."* [Section I(C)(3)(a)]

- ✓ *"Implementation of the minimum control measure … related to construction site stormwater runoff control in accordance with this state permit shall address discharges from transitional sources."* [Section I(C)(3)(b)]

5.3 Public Comment Period

Prior to the submittal of this Action Plan, NVCC will solicit public comment on the Plan. NVCC will consider all comments that are provided. Public comment will be provided through the following means:

- A draft of the Chesapeake Bay TMDL Action plan will be posted on NVCC's website for a minimum of 7 total days.
- An email will be sent to the target audience audiences identified in Minimum Control Measure 1 of the NVCC MS4 Program Plan with a link where the public may comment on the Action Plan.

Solicitation of public comment on the Action Plan addresses the following special condition:

- ✓ *"An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan."* [Section I(C)(2)(a)(12)]

5.4 Annual Reporting

The effectiveness of the Action Plan will be measured through the MS4 General Permit annual reporting requirement. NVCC will report annually on the implementation on the BMPs described in Section 4.1 of this Plan.

Appendix A: Mapping for Characterization of NVCC Campuses

3e EEE Consulting, Inc.
Environmental, Engineering and Educational Solutions

Projection: NAD 1983 StatePlane Virginia North FIPS 4501 Feet

ALEXANDRIA CAMPUS
IMPERVIOUS AND PERVIOUS LAND COVER
NORTHERN VIRGINIA COMMUNITY COLLEGE

0 300 600
Feet

Alexandria, Virginia
Sources: 2009 VGIN Imagery
Prepared by Brian Brown, May 14, 2015

3e EEE Consulting, Inc.
Environmental, Engineering and Educational Solutions

N

ANNANDALE CAMPUS
IMPERVIOUS AND PERVIOUS LAND COVER
NORTHERN VIRGINIA COMMUNITY COLLEGE

0 400 800
Feet

Fairfax, Virginia
Sources: 2009 VGIN Imagery
Prepared by Brian Brown, May 14, 2015

Projection: NAD 1983 StatePlane Virginia North FIPS 4501 Feet

EEE Consulting, Inc.
Environmental, Engineering and Educational Solutions

N

LOUDOUN CAMPUS
IMPERVIOUS AND PERVIOUS LAND COVER
NORTHERN VIRGINIA COMMUNITY COLLEGE

0 400 800
Feet

Loudoun, Virginia
Sources: 2009 VGIN Imagery
Prepared by Brian Brown, May 14, 2015

Projection: NAD 1983 StatePlane Virginia North FIPS 4501 Feet

3e EEE Consulting, Inc.
Environmental, Engineering and Educational Solutions

Projection: NAD 1983 StatePlane Virginia North FIPS 4501 Feet

WOODBRIDGE CAMPUS
IMPERVIOUS AND PERVIOUS LAND COVER
NORTHERN VIRGINIA COMMUNITY COLLEGE

0 500 1,000
Feet

Prince William, Virginia
Sources: 2009 VGIN Imagery
Prepared by Brian Brown, May 14, 2015

Appendix B: Supporting POC Reduction Calculations

NVCC Alexandria Campus Bioretention Calculations Based on Chesapeake Bay Program Retrofit Equations

Per Part IV.2 of DEQ's Guidance Memo No. 15-2005, NVCC may receive POC reduction credits for SWM BMPs initially installed on or after January 1, 2006 and prior to July 1, 2009. As described in Section 4.1 of the NVCC Action Plan, a bioretention facility was installed in April 2009 as part of a design plan titled "Northern Virginia Community College New Construction Phase III Renovations Phase I & II" by EYP Architecture & Engineering, P.C. In order to quantify the amount of nitrogen, phosphorus and sediment being removed by the bioretention facility, the water quality calculations below were conducted based on the Chesapeake Bay Program Retrofit Equations. User defined inputs are based on data from sheet C109 of the design plan. Sheet C109 is included in Appendix C for reference.

BMP#1	BIORETENTION
BMP Type	RR
runoff storage of the BMP (acre-feet)	0.042
Impervious Area treated by BMP (acres)	0.49
Pervious Area treated by BMP (acres)	0.42
Runoff depth treated	1.0300
Removal rates - Nitrogen	60%
Removal rates - Phosphorus	70%
Removal rates - Sediment	76%

Nitrogen	RR	60%
	ST	35%
Phosphorus	RR	70%
	ST	55%
Sediment	RR	76%
	ST	70%

User defined inputs
Calculated by spreadsheet
Referenced cell
TMDL defined (per Table 2b in MS4 GP Section I.C.2.a.4)
CBP Performance Curves (per Table V.B.2 in DEQ Guidance Memo No. 15-2005 Appendix V.B)

Potomac and Shenandoah River Basins	**Pollutant**	**Area served by BMP (ac)**	**Percent of MS4 Regulated Area Treated by BMP**	**2009 EOS Loading Rate (lbs/ac)**	**Loading from BMP Drainage Area**	**Annual POC Reduction Achieved by BMP**
Regulated Urban Impervious	N	0.49	2.53%	16.86	12.49	7.49
Regulated Urban Pervious		0.42		10.07		
Regulated Urban Impervious	P	0.49	2.53%	1.62	0.97	0.68
Regulated Urban Pervious		0.42		0.41		
Regulated Urban Impervious	Sediment	0.49	2.53%	1172.32	648.27	492.69
Regulated Urban Pervious		0.42		175.8		

Calculations for NVCC Loudoun Bioretention Filters / Filterra TN and TSS Reductions

Per Part III.3 of DEQ's Guidance Memo No. 15-2005, NVCC may receive POC reduction credits for SWM BMPs initially installed after June 30, 2009, provided that credit is only taken for reductions in excess of the reductions required by the SWM regulation water quality criteria for the development. As described in Section 4.1 of the NVCC Action Plan, two bioretention filters and a Filterra structure were installed on the Loudoun campus in June 2011 as part of the design plan titled "Northern Virginia Community College Loudoun Phase III North Parking Lot" by EYP Architecture & Engineering, P.C. The aforementioned design plan utilized the bioretention facilities and Filterra structure in order to comply with water quality requirements for the parking lot development. Collectively, these three BMPs exceeded pollutant removal requirements for the development by 0.06 pounds of phosphorus per year per sheet C-P503 of the design plan. Sheet C-P503 is included in Appendix C for reference.

Steps 1 - 4 below are based on DEQ's Guidance Memo No. 15-2005 Example V.E.1 for determining reductions from oversized BMPs.

Step 1: Determine the proportion of BMPs' total TP reductions that may be applied towards the TMDL reduction requirements.

Proportion of BMP's available credit = 0.06 lbs TP/yr / 3.33 lbs TP/yr = 0.018

Step 2: Determine the total post-development TN and TSS loads going to the BMPs.

Loading rates in this step to determine the total associated post-development TN and TSS loads to the BMPs are from Table 4 in the MS4 GP (Potomac River basin). Based on computations included on the Northern Virginia Community College Loudoun Phase III North Parking Lot plan, the total post-development TP load to the BMPs is 7.83 lbs TP/yr.

TN = 7.83 lbs TP/yr * 6.9 lbs TN/lb TP = 54.03 lbs TN/yr
TSS = 7.83 lbs TP/yr * 469.2 lbs TSS/lb TP = 3,673.84 lbs TSS/yr

Step 3: Determine the BMPs' total reductions for TN and TSS:

The BMPs were designed as bioretention and filtering practices; therefore, per the Bay Program Established Efficiencies, a 40% efficiency for TN (the lower of the bioretention/filtering practices TN efficiencies) and an 80% efficiency for TSS were used to calculate total removals.

TN = 54.03 lbs TN/yr * 0.40 = 21.61 lbs TN/yr
TSS = 3,673.84 lbs TSS/yr * 0.80 = 2,939.07 lbs TSS/yr

Step 4: Determine the credit that may be applied towards the TMDL reduction requirements for TN and TSS:

TN = 21.61 lbs TN/yr * 0.018 = 0.39 lbs TN/yr
TSS = 2,939.07 lbs TSS/yr * 0.018 = 52.90 lbs TN/yr

Calculations for NVCC Loudoun Campus Retention III Basin TN and TSS Reductions

Per Part III.3 of DEQ's Guidance Memo No. 15-2005, NVCC may receive POC reduction credits for SWM BMPs initially installed after June 30, 2009, provided that credit is only taken for reductions in excess of the reductions required by the SWM regulation water quality criteria for the development. As described in Section 4.1 of the NVCC Action Plan, a retention basin was installed on the Loudoun campus in July 2012 as part of the design plan titled "Northern Virginia Community College Loudoun Phase III" by EYP Architecture & Engineering, P.C. The aforementioned design plan utilized the retention III basin and two existing facilities (installed prior to 2006) in order to comply with water quality requirements for the phase III development. Collectively, these three BMPs met and exceeded pollutant removal requirements for the development.

In order to determine the excess POC reduction credits remaining solely in the retention III basin that may be applied towards current reduction requirements, water quality worksheet calculations (Situation 2) were conducted for the area draining to the basin and have been included in Appendix B. The water quality calculations are based on the pond's drainage area of 13.52 acres and an impervious cover percentage of 37.1%, per sheet C022 of the design plan. Sheet C022 is included in Appendix C for reference. The 37.1% impervious cover percentage does not include future allowable impervious area (within the 13.52 acres) to ensure that credit is only taken for impervious area currently being treated. Based on the water quality calculations, a BMP that is 49.5% efficient is required to treat the 13.52 acres. The retention III basin installed is 65% efficient, meaning that it is over treating the area it serves by 15.5%. Step 1 below quantifies the pond's available credit based on an overtreatment of 15.5%.

Steps 1 – 4 below are based on DEQ's Guidance Memo No. 15-2005 Example V.E.1 for determining reductions from oversized BMPs.

Step 1: Determine the proportion of the retention III basin's total TP reductions that may be applied towards the TMDL reduction requirements.

Post-development pollutant load = 12.10 lbs TP/yr (see WQ worksheet calculations)

Total reduction provided by the BMP = 12.10 lbs TP/yr * 0.65 = 7.87 lbs TP/yr

BMP's available credit = 12.10 lbs TP/yr * 0.155 = 1.88 lbs TP/yr

Proportion of BMP's available credit = 1.88 lbs TP/yr / 7.87 lbs TP/yr = 0.24

Step 2: Determine the total post-development TN and TSS loads going to the retention III basin.

Loading rates in this step to determine the total associated post-development TN and TSS loads to the BMP are from Table 4 in the MS4 GP (Potomac River basin).

TN = 12.10 lbs TP/yr * 6.9 lbs TN/lb TP = 83.49 lbs TN/yr
TSS = 12.10 lbs TP/yr * 469.2 lbs TSS/lb TP = 5,677.32 lbs TSS/yr

Step 3: Determine the total retention III basin reductions for TN and TSS:

The NVCC facility was designed as a retention III basin; therefore, per the Bay Program Established Efficiencies, a 20% efficiency for TN and a 60% efficiency for TSS were used to calculate total removals.

TN = 83.49 lbs TN/yr * 0.20 = 16.70 lbs TN/yr
TSS = 5,677.32 lbs TSS/yr * 0.60 = 3,406.39 lbs TSS/yr

Step 4: Determine the credit that may be applied towards the TMDL reduction requirements for TN and TSS:

TN = 16.70 lbs TN/yr * 0.24 = 4.01 lbs TN/yr
TSS = 3,406.39 lbs TSS/yr * 0.24 = 817.53 lbs TN/yr

Calculations for NVCC Loudoun Campus Retention III Basin

Worksheet 2 : Situation 2

Summary of Situation 2 criteria: from calculation procedure **STEP 1** thru **STEP 3**, Worksheet 1:

Applicable area (A)* = 13.82 acres

$\mathbf{I_{post}}$ = (total post-development impervious cover ÷ A) × 100 = 37.1 %

$\mathbf{I_{watershed}}$ = _____ % **or** $I_{watershed}$ = 16%

$\mathbf{I_{existing}}$ = (total existing impervious cover ÷ A*) × 100 = _____ %

$\mathbf{I_{existing}}$ _____ % • • $\mathbf{I_{watershed}}$ _____ %; **and**

$\mathbf{I_{post}}$ 37.1 % > $\mathbf{I_{watershed}}$ 16 %

STEP 4 **Determine the relative pre-development pollutant load (L_{pre}).**

$\mathbf{L_{pre(watershed)}}$ = [0.05 + (0.009 × $I_{watershed}$)] × A × 2.28 (**Equation 5-16**)

where: $L_{pre(watershed)}$ = relative pre-development total phosphorous load (pounds per year)
$I_{watershed}$ = average land cover condition for specific watershed or locality **or** the Chesapeake Bay default value of 16% (percent expressed in whole numbers)
A = applicable area (acres)

$\mathbf{L_{pre(watershed)}}$ = [0.05 + (0.009 × 16%)] × 13.82 × 2.28

= 6.11 pounds per year

Worksheet 2 : Situation 2
Page 2 of 4

STEP 5 **Determine the relative post-development pollutant load (L_{post}).**

$\mathbf{L_{post}} = [0.05 + (0.009 \times I_{post})] \times A \times 2.28$ (**Equation 5-21**)

where: L_{post} = relative post-development total phosphorous load (pounds per year)
I_{post} = post-development percent impervious cover (percent expressed in whole numbers)
A = applicable area (acres)

$\mathbf{L_{post}} = [0.05 + (0.009 \times$ 37.1% $)] \times$ 13.82 $\times 2.28$

= 12.10 pounds per year

STEP 6 **Determine the relative pollutant removal requirement (RR).**

$\mathbf{RR} = L_{post} - L_{pre(watershed)}$

RR = 12.10 - 6.11

= 5.99 pounds per year

STEP 7 **Identify best management practice (BMP) for the site.**

1. Determine the required pollutant removal efficiency for the site:

$\mathbf{EFF} = (RR \div L_{post}) \times 100$ **(Equation 5-22)**

where: EFF = required pollutant removal efficiency (percent expressed in whole numbers)
RR = pollutant removal requirement (pounds per year)
L_{post} = relative post-development total phosphorous load (pounds per year)

EFF = (5.99 ÷ 12.10) × 100

= 49.5 %

Appendix C: Supporting BMP Design Plans

MINIMUM BMP REQUIREMENTS

SEE LANDSCAPE PLAN

		COVERAGE (SQ.FT.)		
QUANTITY	SIZE	UNIT	TOTAL	SPACING
3	2'-3 ½" CAL.	200	600	12' O.C.
5 3	3 GALLONS 3 GALLONS	–	–	8' O.C. 8' O.C.
1,240	ROOTED CUTTINGS	–	–	1' O.C.

BMP FACILITY DESIGN CALCULATIONS

1. WATER QUALITY NARRATIVE:

BMP – OCCOQUAN METHOD

40% SITE PHOSPHOROUS REMOVAL EFFICIENCY REQUIRED

DEVICE	%EFFICIENT
RAIN GARDEN	65%

SITE AREA = 1.80 ACRES
ON-SITE AREA TO RAIN GARDEN = 0.91 ACRES
OFF-SITE AREA TO RAIN GARDEN = 0.0 ACRES
TOTAL AREA TO RAIN GARDEN = 0.91 ACRES

ON-SITE AREA NOT DRAINING TO THE RAIN GARDEN = 0.89 ACRES

OPEN SPACE AREA FOR BMP CREDIT = 0.0 ACRES

2. WATERSHED INFORMATION: (WHOLE SITE)

SUB-AREA DESIGNATION AND DESCRIPTION	"C"	ACRES
–CONTROLLED–		
ON-SITE – BUILDINGS	0.90	0.39
ON-SITE – GRASS & SIDEWALKS	0.42	0.52
–UNCONTROLLED–		
ON-SITE – SIDEWALK & GRASS	0.45	0.13
ON-SITE – SIDEWALK & GRASS	0.40	0.14
ON-SITE – GRASS	0.30	0.08
ON-SITE – SIDEWALK & GRASS	0.45	0.56

3. WEIGHTED AVERAGE "C" FACTOR FOR THE SITE

AREA OF THE SITE 1.80 ACRES

SUBAREA DESIGNATION	"C"	ACRES	PRODUCT
–CONTROLLED–			
ON-SITE – ROOS & SIDEWALKS	0.90	0.39	0.35
ON-SITE – GRASS & SIDEWALKS	0.42	0.52	0.22
–UNCONTROLLED–			
ON-SITE – SIDEWALK & GRASS	0.45	0.13	0.06
ON-SITE – SIDEWALK & GRASS	0.40	0.14	0.05
ON-SITE – GRASS	0.30	0.06	0.02
ON-SITE – SIDEWALK & GRASS	0.45	0.56	0.25
		TOTAL =	0.91

AVERAGE "C" FACTOR FOR SITE 0.91/1.80 = 0.506

4. PHOSPHORUS REMOVAL FOR THE SITE

SUBAREA	BMP TYPE	REMOVAL EFF.	AREA		"C"	PRODUCT
ON-SITE	RAIN GARDEN	65%	0.39/1.80	X	0.90/0.506	= 25.00
ON-SITE	RAIN GARDEN	65%	0.52/1.80	X	0.42/0.506	= 15.65
					TOTAL =	40.65%

BIORETENTION COMPUTATIONS:

REQUIRED SURFACE AREA IS BASED UPON TREATING THE FIRST 1.0" RUNOFF FROM THE TOTAL IMPERVIOUS OF THE SITE FLOWING TO THE FACILITY. SEE THIS SHEET FOR BMP COMPUTATIONS AND NARRATIVE.

TOTAL AREA DRAINING TO THE FACILITY = 0.86 ACRES
IMPERVIOUS AREA DRAINING TO THE FACILITY = 0.49AC. OR 21,344 FT2

TREATING 1" OF RUNOFF WILL GET A 65% EFFICIENCY
CAPTURING THE FIRST 1" OF RUNOFF REQUIRES THE RETENTION BED TO BE A MINIMUM OF 52 OF THE IMPERVIOUS AREA DRAINING TO IT.

WQV = (0.05)(21,344 FT2) = 1,067FT2 (MINIMUM SURFACE AREA)

1" OF RUNOFF FOR 21,344 FT2 OF IMPERVIOUS AREA REQUIRES A TOTAL STORAGE ABOVE THE BIORETENTION FACILITY TO BE AT LEAST (1"/12)(21,344 FT2) = 1,780CF.

A MAXIMUM OF 1' OF HEAD IS ALLOWED OVER THE FACILITY AT ANY TIME. THEREFORE, THE AREA OF THIS FACILITY MUST BE AT LEAST 1,780SF. THE ACTUAL AREA IS 1,830SF.

1,830SF ≥ 1,780SF

PLANT REQUIREMENTS:
10 TREES/ 1000SF OF BASIN AREA
1,830/1,000 = 1.8(10)= 18 TREES
USING A 2:1 TO 3:1 RATIO OF SHRUBS TO TREES = (2.5)(18) = 45 SHRUBS

TREE SPACING IS 12', SHRUB SPACING IS 8'

SEE SHEET #C110 FOR DIMENSIONS OF THE BED

BIORETENTION MAINTENANCE:

THE RETENTION FACILITY WILL BE PRIVATELY MAINTAINED.

BIORETENTION AREA SOIL SPECIFICATION

1. PLANTING SOIL

THE BIORETENTION AREAS SHALL CONTAIN A PLANTING SOIL MIXTURE OF 50% SAND, 30% LEAF COMPOST (FULLY COMPOSTED, NOT PARTIALLY ROTTED LEAVES), AND 20% TOPSOIL. TOPSOIL SHALL BE SANDY LOAM OR LOAMY SAND OF UNIFORM COMPOSITION, CONTAINING NO MORE THAN 5% CLAY, FREE OF STONES, STUMPS, ROOTS OR SIMILAR OBJECTS GREATER THAN ONE INCH. BRUSH, OR ANY OTHER MATERIAL OR SUBSTANCE WHICH MAY BE HARMFUL TO PLANT GROWTH, OR HINDRANCE TO PLANT GROWTH OR MAINTENANCE. THE TOPSOIL SHALL BE FREE OF PLANTS OR PLANT PARTS OF BERMUDA GRASS, QUACK GRASS, JOHNSON GRASS, MUGWORT, NUT SEDGE, POISON IVY, CANADIAN THISTLE OR OTHERS AS SPECIFIED. IT SHALL NOT CONTAIN TOXIC SUBSTANCES HARMFUL TO PLANT GROWTH.

THE TOPSOIL SHALL BE TESTED AND MEET THE FOLLOWING CRITERIA

PH RANGE: 5.0–7.0
ORGANIC MATTER: GREATER THAN 1.5%
MAGNESIUM (MG): 100+ UNITS
PHOSPHORUS (P2O5): 150+ UNITS
POTASSIUM (K20): 120+ UNITS
SOLUBLE SALTS: NOT TO EXCEED 500 PPM/. 9 MMHOS/CM (SOIL)
NOT TO EXCEED 3,000 PPM/2.5 MMHOS/CM (ORGANIC MIX)

THE FOLLOWING TESTING FREQUENCIES SHALL APPLY TO THE ABOVE SOILS CONSTITUENTS:

pH, ORGANIC MATTER: 1 TEST PER 90 CY, BUT NO MORE THAN 1 TEST PER BIORETENTION AREA

MAGNESIUM, PHOSPHOROUS, POTASSIUM, SOLUBLE SALTS: 1 TEST PER 500 CY, BUT NO LESS THAN 1 TEST PER BORROW SOURCE

ONE GRAIN SIZE ANALYSIS SHALL BE PERFORMED PER 90 CY OF PLANTING SOIL, BUT NO LESS THAN 1 TEST PER BIORETENTION AREA. SOIL TEST MUST BE VERIFIED BY A QUALIFIED PROFESSIONAL.

2. MULCH
A MULCH LAYER SHALL BE PROVIDED ON TOP OF THE PLANTING SOIL. THE MULCH LAYER BE STANDARD LANDSCAPE STYLE, SINGLE OR DOUBLE, SHREDDED HARDWOOD MULCH OR CHIPS. THE MULCH LAYER SHALL BE WELL AGED (STOCKPILED OR STORED FOR TAT LEAST 12 MONTHS), UNIFORM IN COLOR, AND FREE OF OTHER MATERIALS, SUCH AS WEED SEEDS, SOIL, ROOTS, ETC., THE MULCH SHALL BE APPLIED TO A MAXIMUM DEPTH OF THREE INCHES. GRASS CLIPPINGS SHALL NOT BE USED AS A MULCH MATERIAL.

3. SAND
THE SAND FOR BIORETENTION BASINS SHALL BE ASTM C-33 CONCRETE SAND AND FREE OF DELETERIOUS MATERIAL.

4. COMPACTION
SOIL SHALL BE PLACED IN LIFTS LESS THAN 18 INCHES AND LIGHTLY COMPACTED (MINIMUM COMPACTION EFFORT) BY TAMPING OR ROLLED WITH HAND–OPERATED LANDSCAPE ROLLER.

5. PEA GRAVEL DIAPHRAGM AND CURTAIN DRAIN
THE PEA GRAVEL FOR THE BIORETENTION BASINS SHALL BE CLEAN BANK–RUN RIVER PEA GRAVEL, ASTM D 448 SIZE NO. 8, WITH A SIZE APPROXIMATELY 1/8" TO ½"

6. UNDERDRAIN GRAVEL
THE UNDERDRAIN GRAVEL FOR THE BIORETENTION BASINS SHALL BE CLEAN BANK–RUN RIVER PEA GRAVEL, ASTM M–43, WITH A SIZE OR ½" TO 2".

7. PVC PIPING
THE PIPING FOR THE BIORETENTION BASINS SHALL BE 6" RIGID SCHEDULE 40 PVC, AASHTO M–278, WITH 3/8" PERFORATIONS AT 6" CENTERS WITH A MINIMUM OF 4 HOLES PER ROW WHERE REQUIRED.

BIORETENTION AREA PLANTING SPECIFICATIONS

1. ROOTSTOCK OF THE PLANT MATERIAL SHALL BE KEPT MOIST DURING TRANSPORT FORM THE SOURCE TO THE JOB SITE AND UNTIL PLANTED.

2. WALLS OF PLANTING PIT SHALL BE DUG SO THAT THEY ARE VERTICAL.

3. THE DIAMETER OF THE PLANTING PIT MUST BE A MINIMUM OF SIX INCHES (6") LARGER THAN THE DIAMETER OF THE BALL OF THE TREE.

4. THE PLANTING PIT SHALL BE DEEP ENOUGH TO ALLOW 1/8 OF OVERALL DIMENSION OF THE ROOT BALL TO BE ABOVE GRADE. LOOSE SOIL AT THE BOTTOM OF THE PIT SHALL BE TAMPED BY HAND.
5. THE APPROPRIATE AMOUNT OF FERTILIZER IS TO BE PLACED AT THE BOTTOM OF THE PIT.

6. THE PLANT SHALL BE REMOVED FROM THE CONTAINER AND PLACED IN THE PLANTING PIT BY LIFTING AND CARRYING THE PLANT BY ITS' BALL (NEVER LIFT BY BRANCHES OR TRUNK).

7. SET THE PLANT STRAIGHT AND IN THE CENTER OF THE PIT SO THAT APPROXIMATELY 1/8 OF THE DIAMETER OF THE ROOT BALL IS ABOVE THE FINAL GRADE.

8. BACKFILL PLANTING PIT WITH EXISTING SOIL
9. MAKE SURE PLANT REMAINS STRAIGHT DURING BACKFILLING PROCEDURE.

10. NEVER COVER THE TOP OF THE BALL WITH SOIL. MOUND SOIL AROUND THE EXPOSED BALL.

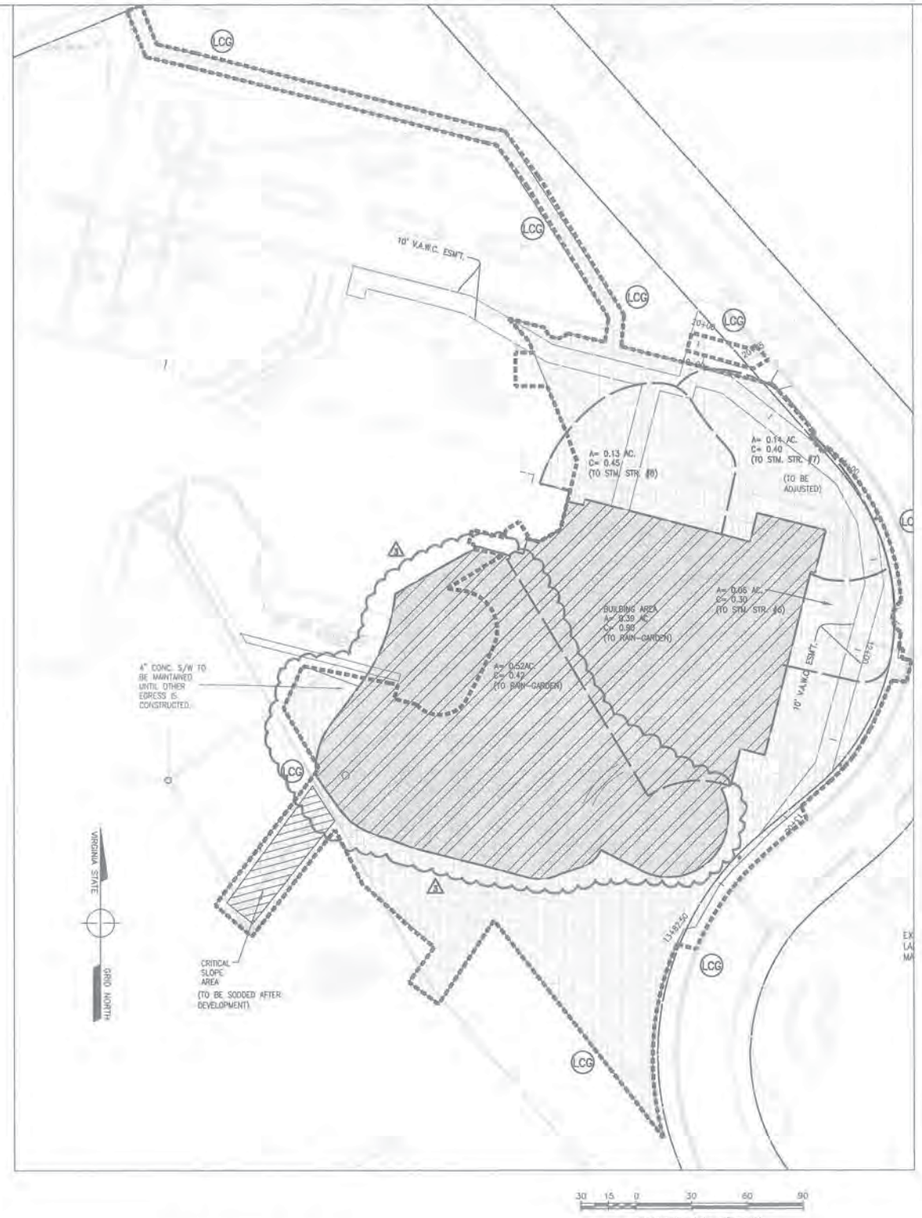
11. USING 2" BY 2" WHITE OAK STAKES SHALL BRACE TREES. STAKES SHALL BE PLACED PARALLEL TO WALKWAYS AND BUILDINGS. STAKES ARE TO BE EQUALLY SPACED ON THE OUTSIDE OF THE TREE BALL. UTILIZING HOSE AND WIRE THE TREE IS BRACED TO THE STAKES.

12. BECAUSE OF THE HIGH LEVELS OF NUTRIENTS IN STORM WATER RUNOFF TO BE TREATED, BIORETENTION BASIN PLANTS SHOULD NOT REQUIRE CHEMICAL FERTILIZATIONS.

BIORETENTION CONSTRUCTION SPECIFICATIONS

SEQUENCE OF CONSTRUCTION:

1. THIS FACILITY IS TO BE BUILT IN THE LAST STAGES OF THE SITE'S CONSTRUCTION IN AN EFFORT TO PREVENT SEDIMENT LADEN WATER, CAUSED BY CONSTRUCTION, FROM ENTERING THE RAINGARDEN FACILITY.
2. INSTALL PHASE I AND II EROSION AND SEDIMENT CONTROL MEASURES FOR THE SITE.
3. ENSURE THAT THE DITCH AND SILT FENCES ARE ADEQUATELY INSTALLED AND STABILIZED.
4. FINAL GRADE AND STABILIZE THE SITE WHERE THE BIORETENTION AREA WILL BE CONSTRUCTED TO HELP PREVENT ANY UNSUITABLE SOIL FROM ENTERING, AND POSSIBLY CONTAMINATING, THE BMP AREA.
5. EXCAVATE THE BIORETENTION AREA TO THE PROPOSED DEPTH. USE RELATIVELY LIGHT, TRACKED EQUIPMENT TO AVOID COMPACTION OF THE BASIN FLOOR. AFTER FINAL GRADING IS COMPLETED, DEEPLY TILL THE BASIN FLOOR WITH ROTARY TILLERS OR DISC HARROWS TO PROVIDE A WELL AERATED, HIGHLY POROUS SURFACE TEXTURE.
6. INSTALL THE INFILTRATION CHAMBERS, PIPING, MANIFOLDS, DRAINS, VENTS AND INFILTRATION STONE IN ACCORDANCE WITH THE SPECIFICATIONS AND/OR DIRECTIONS OF THE CHAMBER MANUFACTURER. INSTALL AN EIGHT INCH LAYER OF WASHED, ¾ INCH PEA GRAVEL AT THE BITOM OF THE FACILITY. INSTALL A 1'–FOOT LAYER OF ATSM C–33 CONCRETE SAND ON TOP OF THE PEA GRAVEL. LIGHTLY COMPACT WITH A LANDSCAPING ROLLER.
7. AFTER CONFIRMATION THAT THE SOIL MEETS SPECS BY PERFORMING THE REQUISITE GRADATION AND CHEMICAL TESTS, FILL THE BIORETENTION AREA WITH PLANTING SOIL AND SAND, AS SHOWN IN THE PLANS AND DETAILED IN THE SPECIFICATIONS.
8. INSTALL VEGETATION AND GROUND COVER SPECIFIED IN THE PLANTING PLAN FOR BIORETENTION AREA. INSTALL MULCH LAYER.
9. UPON AUTHORIZATION FROM THE INSPECTOR, REMOVE ALL SEDIMENT CONTROLS AND STABILIZE ALL DISTURBED AREAS.



— AREA TO RAIN GARDEN

— AREA TO SWM

— UNDETAINED AREA

Elsbeun Yellin Prescott
Architecture & Engineering, P.C.
1000 Potomac Street, NW
Washington, D.C. 20007
Telephone: 202.471.5000
Fax: 202.471.5050

eypae.com:

EYP/

CONSULTANTS:

CIVIL ENGINEERING:

William H. Gordon Associates, Inc.
The Gordon Building
4501 Daly Drive
Chantilly, VA 20151
Telephone 703 263 1900

STRUCTURAL ENGINEERING:

Cagley & Associates
6141 Executive Blvd
Rockville MD 20852
Telephone 301 881 9050

LANDSCAPE DESIGN:

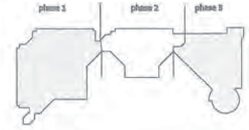
Stephenson & Good
815 North Royal Street, suite 200
Alexandria, VA 22314
Telephone 703 548 2000

COST ESTIMATING:

Belstar, Inc
8408 Arlington Blvd, Suite 100
Fairfax, VA 22031
Telephone 703 645 0280

VERTICAL TRANSPORTATION:

Vertran Enterprises, Ltd.
14 Oak Court
Annapolis, MD 21401
Telephone 301 261 8222



KEY PLAN:

BULLETIN #31
APPROVED BY DCR 09.06.07

NO.	REVISION/SUBMISSION	DATE
3	REVISED WORKING DRAWINGS	07.16.07
2	REVISED WORKING DRAWINGS	09.29.06
1	BCOM WD REVIEW	08.01.06

NORTHERN VIRGINIA COMMUNITY COLLEGE NEW CONSTRUCTION PHASE III RENOVATION PHASE I & II

Alexandria Campus
3001 North Beauregard Street
Alexandria, VA 22311

NVCC Project Code: 260-16718

DATE: 08.01.2006
SCALE: 1" = 30'
EYP PROJECT NO. 2003007.00
DESIGNED BY: C. BRADY
DRAWN BY: J. WEBB
CHECKED BY: M. JOHNSON

COMMONWEALTH OF VIRGINIA
CARLYLE A. BRADY
NO. 025930
PROFESSIONAL ENGINEER
09/29/07

WHDA # 2027/0101 / 0101BMP.DWG

BMP COMPUTATIONS & NOTES

C109

RESUBMITTED WORKING DRAWINGS

FILTERRA SIZING COMPUTATION

TOTAL AREA TO WATER QUALITY STRUCTURE = 0.37 Ac.
TOTAL IMPERVIOUS AREA TO WATER QUALITY STRUCTURE = 0.34 Ac.

PER MINIMUM STANDARD 3.11C OF THE DCR VIRGINIA STORMWATER MANAGEMENT PROGRAM GUIDELINES, THE REQUIRED SURFACE AREA OF A FILTERRA STRUCTURE IS 0.33% OF THE TOTAL IMPERVIOUS AREA DRAINING TO IT.

0.33% OF 0.34 Ac. = 48.87 SQ. FT.

THEREFORE A 6'x10' BOX WITH A SURFACE AREA OF 60 SQ. FT. IS CHOSEN, WITH THE 10' RUNNING ALONG THE CURB & GUTTER LINE.

SEE THE 10 X 6 SIZING DESIGNATION ON THE "PRECAST FILTERRA UNIT NARROW WIDTH CONFIGURATION" DETAIL ON THIS SHEET FOR ALL DIMENSIONS.

filterra

Filterra Standard Plan Notes

Construction & Installation

A. Each unit shall be constructed at the locations and elevations according to the sizes shown on the approved drawings. Any modifications to the elevation or location shall be at the direction of and approved by the Engineer.

B. If the Filterra® is stored before installation, the top slab must be placed on the box using the 2x4 wood provided, to prevent any contamination from the site. All internal fittings supplied (if any), must be left in place as per the delivery.

C. The unit shall be placed on a compacted sub-grade with a minimum 6-inch gravel base matching the final grade of the curb line in the area of the unit. The unit to be placed such that the unit and top slab match the grade of the curb in the area of the unit. Compact undisturbed sub-grade materials to 95% of maximum density at +1- 2% of optimum moisture. Unsuitable material below sub-grade shall be replaced to the site engineer's approval.

D. Outlet connections shall be aligned and sealed to meet the approved drawings with modifications necessary to meet site conditions and local regulations.

E. Once the unit is set, the internal wooden forms and protective mesh cover must be left intact. Remove only the temporary wooden shipping blocks between the box and top slab. The top lid should be sealed onto the box section before backfilling, using a non-shrink grout, butyl rubber or similar waterproof seal. The boards on top of the lid and boards sealed in the unit's throat must NOT be removed. The Supplier (Americast or its authorized dealer) will remove these sections at the time of activation. Backfilling should be performed in a careful manner, bringing the appropriate fill material up in 6" lifts on all sides. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of Filterra® unit shall conform to ASTM specification C891 "Standard Practice for Installation of Underground Precast Utility Structures", unless directed otherwise in contract documents.

F. Curb and gutter construction (where present) shall ensure that the flow-line of the Filterra® units is at a greater elevation than the flow-line of the bypass structure or relief (drop inlet, curb cut or similar). Failure to comply with this guideline may cause failure and/or damage to the Filterra® environmental device.

Activation

A. Activation of the Filterra® unit is performed ONLY by the Supplier. Purchaser is responsible for Filterra® inlet protection and subsequent clean out cost. This process cannot commence until the project site is fully stabilized and cleaned (full landscaping, grass cover, final paving and street sweeping completed), negating the chance of construction materials contaminating the Filterra® system. Care shall be taken during construction not to damage the protective throat and top plates.

B. Activation includes installation of plant(s) and mulch layers as necessary.

Maintenance

A. Each correctly installed Filterra® unit is to be maintained by the Supplier, or a Supplier approved contractor for a minimum period of 1 year. The cost of this service is to be included in the price of each Filterra® unit. Extended maintenance contracts are available at extra cost upon request.

B. Annual maintenance consists of a maximum of (2) scheduled visits. The visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

C. Each maintenance visit consists of the following tasks:

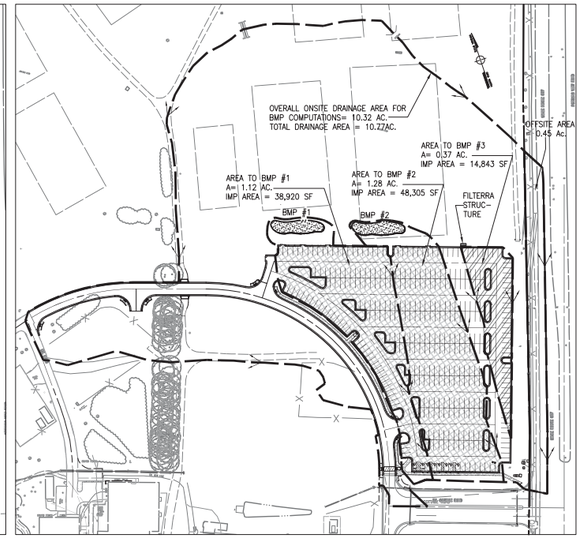
1. Filterra® unit inspection
2. Foreign debris, silt, mulch & trash removal
3. Filter media evaluation and recharge as necessary
4. Plant health evaluation and pruning or replacement as necessary
5. Replacement of mulch
6. Disposal of all maintenance refuse items
7. Maintenance records updated and stored (reports available upon request)

D. The beginning and ending date of Supplier's obligation to maintain the installed system shall be determined by the Supplier at the time the system is activated. Owners must promptly notify the Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology.

01-09-05 www.filterra.com Toll Free: (866) 349-3455

01-09-05 www.filterra.com Toll Free: (866) 349-3455

BMP DRAINAGE MAP – EXISTING IMPERVIOUS AREA
1"=100'


OVERALL ONSITE DRAINAGE AREA FOR BMP COMPUTATIONS= 10.32 AC.
TOTAL DRAINAGE AREA = 10.77AC.
OFFSITE AREA = 0.45 Ac.
AREA TO BMP #1 A= 1.12 AC. IMP AREA = 38,920 SF
AREA TO BMP #2 A= 1.28 AC. IMP AREA = 48,305 SF
AREA TO BMP #3 A= 0.37 AC. IMP AREA = 14,843 SF
BMP #1
BMP #2
FILTERRA STRUC-TURE

BMP DRAINAGE MAP – PROPOSED IMPERVIOUS AREA
1"=100'

100 50 0 100 200 300
GRAPHICAL SCALE: 1" = 100'

BMP MAP LEGEND

DENOTES IMPERVIOUS AREA

SITE AREA TO RAIN GARDEN

SITE AREA TO FILTERRA STRUCTURE

BEST MANAGEMENT PRACTICE COMPUTATIONS

PERFORMANCE BASED WATER QUALITY CALCULATION PROCEDURE
(FROM THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK)

STEP 1: DETERMINE THE APPLICABLE AREA (A) AND THE POST DEVELOPED IMPERVIOUS COVER (Ipost).

THE APPLICABLE AREA (PLANNING AREA) WAS ESTABLISHED BY THE DRAINAGE DIVIDE THAT CONTAINS THE PROPOSED IMPERVIOUS AREA WITH THIS SITE PLAN. THE OFFSITE AREA IS SUBTRACTED FROM THE DRAINAGE DIVIDE.

PROPOSED CONDITIONS:
THE PROPOSED CONDITIONS CONSIST OF IMPERVIOUS AREA ADDED FROM THE CONSTRUCTION OF THE PARKING LOT NORTH OF COTTAGE ROAD AND THE EXTENTION OF THE RING ROAD.

TOTAL DRAINAGE AREA = 469,141 SF OR 10.77 ACRES

ONSITE DRAINAGE AREA = 449,539 SF OR 10.32 ACRES

THE PERCENT IMPERVIOUS AREA OF THE ONSITE PROPOSED CONDITIONS = 31.4%.

STEP 2: DETERMINE THE EXISTING IMPERVIOUS COVER (existing) OR USE THE AVERAGE LAND COVER CONDITION (lwatershed).

EXISTING CONDITIONS:
PERCENT IMPERVIOUS 6%

AVERAGE LAND COVER CONDITION (LOUDOUN COUNTY) 16%

THE AVERAGE LAND COVER CONDITION WILL BE USED.

STEP 3: DETERMINE THE APPROPRIATE DEVELOPMENT SITUATION.

DEVELOPMENT ON THE NVCC LOUDOUN NORTH PARKING LOT IS MOST RELATED TO SITUATION 2, WHERE THE EXISTING PERCENT IMPERVIOUS COVER (lexisting) IS LESS THAN OR EQUAL TO THE AVERAGE LAND COVER CONDITION (lwatershed) AND THE PROPOSED IMPROVEMENTS WILL CREATE A TOTAL PERCENT IMPERVIOUS COVER (lpost) WHICH IS GREATER THAN THE AVERAGE LAND COVER CONDITION (lwatershed).

REQUIREMENT: THE POLLUTANT DISCHARGE AFTER DEVELOPMENT (Lpost) SHALL NOT EXCEED THE EXISTING POLLUTANT DISCHARGE BASED ON THE AVERAGE LAND COVER CONDITION (Lpre(watershed)).

STEP 4: DETERMINE THE RELATIVE PRE-DEVELOPMENT POLLUTANT LOAD (Lpre).

PRE-DEVELOPMENT POLLUTANT LOAD = (Lpre)

Lpre(watershed)= [0.05+(0.009 x I(watershed))] x A x 2.28
I(watershed)= 16%
A = 10.32 ACRES

Lpre(watershed)= 4.56 LBS/YR

BEST MANAGEMENT PRACTICE COMPUTATIONS (CONT.)

STEP 5: DETERMINE THE RELATIVE POST-DEVELOPMENT POLLUTANT LOAD L(post).

THE POST-DEVELOPMENT POLLUTANT LOAD IS CALCULATED BASED ON THE PROPOSED IMPERVIOUS COVER.

L(post) = [0.05+(0.009 x I(post))] x A x 2.28
I(post)= 31.4%
A = 10.32 ACRES

L(post) = 7.83 LBS/YR

STEP 6: DETERMINE THE RELATIVE POLLUTANT REMOVAL REQUIREMENT (RR).

THE POLLUTANT REMOVAL REQUIREMENT (RR) IS DEFINED AS THE RELATIVE AMOUNT OF THE KEYSTONE POLLUTANT (IN POUNDS PER YEAR) WHICH MUST BE REMOVED BY A BMP.

SITUATION 2 = RR = L(post) – Lpre(watershed)

RR = 7.83 – 4.56 = 3.27 LBS/YR

STEP 7: IDENTIFY BEST MANAGEMENT PRACTICE (BMP) OPTIONS FOR THE SITE.

BMP CREDIT FOR PROPOSED CONDITIONS ON THE SITE WILL BE TAKEN FROM 2 (TWO) PROPOSED RAIN GARDEN (BIORETENTION) FACILITIES.

BMP #1 (BIORETENTION FILTER)
L(BMP #1)= [0.05+(0.009 x Ipost(BMP #1))] x A x 2.28
Ipost(BMP #1)= 80.1%
A = 1.12 ACRES

L(BMP #1)= 1.97 LBS/YR

Lremoved(BMP #1) = L(BMP #1) X EFF(BMP #1)
EFF(BMP #1) = 65%
Lremoved(BMPbio) = 1.28 LBS/YR REMOVED

BMP #2 (BIORETENTION FILTER)
L(BMP #2)= [0.05+(0.009 x Ipost(BMP #2))] x A x 2.28
Ipost(BMP #2)= 86.5%
A = 1.28 ACRES

L(BMP #2)= 2.42 LBS/YR

Lremoved(BMP #2) = L(BMP #2) X EFF(BMP #2)
EFF(BMP #2) = 65%
Lremoved(BMP #2) = 1.57 LBS/YR REMOVED

BMP #3 (FILTERRA)
L(BMP #3)= [0.05+(0.009 x Ipost(BMP #3))] x A x 2.28
Ipost(BMP #3)= 92.3%
A = 0.37 ACRES

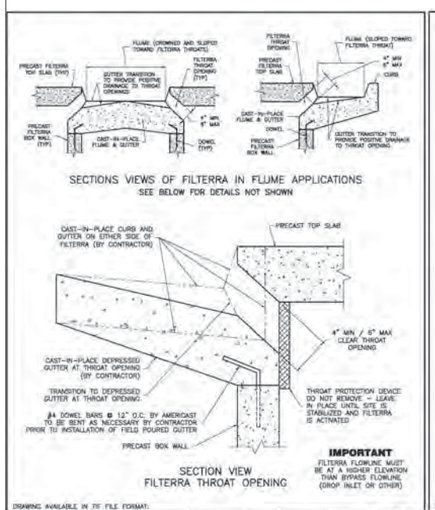
L(BMP #3)= 0.74 LBS/YR

Lremoved(BMP #3) = L(BMP #3) X EFF(BMP #3)
EFF(BMP #3) = 65%
Lremoved(BMP #3) = 0.48 LBS/YR REMOVED

Lremoved(Total) = 1.28 + 1.57 + 0.48 = 3.33 LBS/YR REMOVED TOTAL

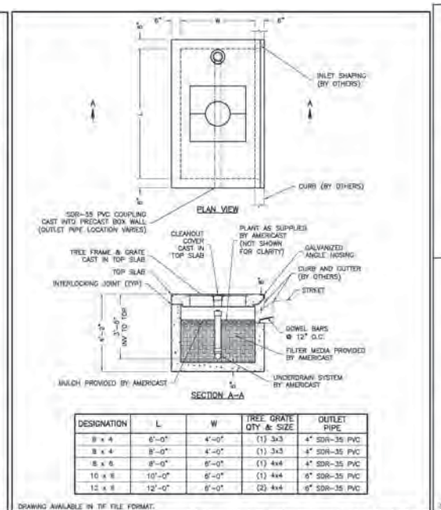
RR = 3.27 LBS/YR < Lremoved(Total) = 3.33 LBS/YR REMOVED TOTAL

THEREFORE POLLUTANT REMOVAL REQUIREMENTS HAVE BEEN MET.


SECTIONS VIEWS OF FILTERRA IN FLUME APPLICATIONS
SEE BELOW FOR DETAILS NOT SHOWN
SECTION VIEW FILTERRA THROAT OPENING
4" MIN / 6" MAX CLEAR THROAT OPENING
PRECAST TOP SLAB
PRECAST BOX WALL
IMPORTANT
FILTERRA FLOWLINE MUST BE AT A HIGHER ELEVATION THAN BYPASS FLOWLINE (DROP INLET OR OTHER)

DRAWING AVAILABLE IN .TIF FILE FORMAT.

AMERICAST | DATE: 02-23-05 | DWG: CGT-3 | FILTERRA® THROAT OPENING AND GUTTER OR FLUME DETAIL | filterra US PAT 6,277,274 AND 6,569,321


PLAN VIEW
SECTION A–A
INLET SHAPING (BY OTHERS)
CURB (BY OTHERS)
SDR-35 PVC COUPLING CAST INTO PRECAST BOX WALL (OUTLET PIPE LOCATION VARIES)
CLEANOUT COVER CAST IN TOP SLAB
PLANT AS SUPPLIED BY AMERICAST (NOT SHOWN FOR CLARITY)
TREE FRAME & GRATE CAST IN TOP SLAB
GALVANIZED ANGLE NOSING
CURB AND GUTTER (BY OTHERS)
TOP SLAB
INTERLOCKING JOINT (TYP)
STRIKE
GOWEL BARS @ 12" O.C.
FILTER MEDIA PROVIDED BY AMERICAST
MULCH PROVIDED BY AMERICAST
UNDERDRAIN SYSTEM BY AMERICAST

DESIGNATION	L	W	TREE GRATE QTY & SIZE	OUTLET PIPE
3' x 4'	6'-0"	4'-0"	(1) 3x3	4" SDR-35 PVC
3' x 4'	8'-0"	4'-0"	(1) 3x3	4" SDR-35 PVC
6' x 6'	8'-0"	6'-0"	(1) 4x4	4" SDR-35 PVC
10' x 6'	10'-0"	6'-0"	(1) 4x4	6" SDR-35 PVC
12' x 6'	12'-0"	6'-0"	(2) 4x4	6" SDR-35 PVC

DRAWING AVAILABLE IN .TIF FILE FORMAT.

AMERICAST | DATE: 12-22-04 | DWG: FTNW-2 | PRECAST FILTERRA® UNIT NARROW WIDTH CONFIGURATION MID-ATLANTIC REGION | filterra US PAT 6,277,274 AND 6,569,321

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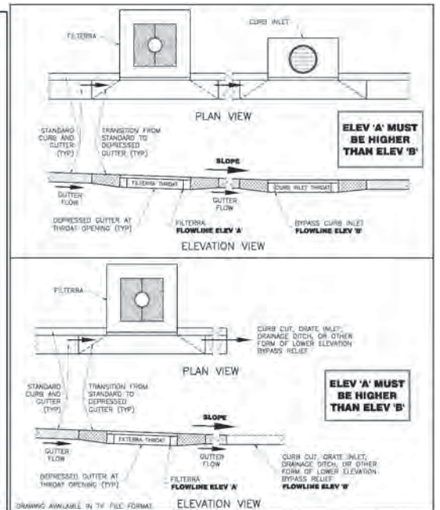
PLAN VIEW
ELEVATION VIEW
ELEV 'A' MUST BE HIGHER THAN ELEV 'B'
FILTERRA
CURB INLET
STANDARD CURB AND GUTTER (TYP)
TRANSITION FROM STANDARD TO DEPRESSED GUTTER (TYP)
SLOPE
GUTTER FLOW
DEPRESSED GUTTER AT THROAT OPENING (TYP)
FILTERRA FLOWLINE ELEV 'A'
CURB INLET THROAT
BYPASS CURB INLET FLOWLINE ELEV 'B'
CURB CUT, GRATE, INLET, DRAINAGE DITCH, OR OTHER FORM OF LOWER ELEVATION BYPASS RELIEF

DRAWING AVAILABLE IN .TIF FILE FORMAT.

AMERICAST | DWG: 05-09-05 | DWG: FLR-2 | FILTERRA® TYPICAL FLOWLINE RELATIONSHIP FOR REQUIRED EFFECTIVE BYPASS | filterra US PAT 6,277,274 AND 6,569,321

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Hisham Yaffie Prescott
Architecture & Engineering, P.C.
412 Broadway
P.O. Box 617
Albany, NY 12201-0617
Telephone: 518.431.3900
Fax: 518.431.3333
eypae.com

EYP/

CONSULTANTS:

CML ENGINEERING · SURVEY · LANDSCAPE ARCHITECTURE · LAND PLANNING · SITE SECURITY CONSULTING · GIS
William H. Gordon Associates, Inc.
4501 Daly Drive · Chantilly, Virginia 20151
(703) 263-1900 · METRO (703) 803-9508 · FAX (703) 263-0766

GENERAL NOTES:

1. CONSTRUCTION SPECIFICATIONS FOR METHODS & MATERIALS OF BIORETENTION FILTER FACILITIES SHALL BE PER MINIMUM STANDARD 3.11 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK.

KEY PLAN:

NO.	REVISION/SUBMISSION	DATE
1.	RESPOND TO DCR COMMENTS	06-19-09

NORTHERN VIRGINIA COMMUNITY COLLEGE LOUDOUN PHASE III NORTH PARKING LOT

Loudoun Campus
1000 Harry Flood Byrd Highway
Sterling, VA 20164

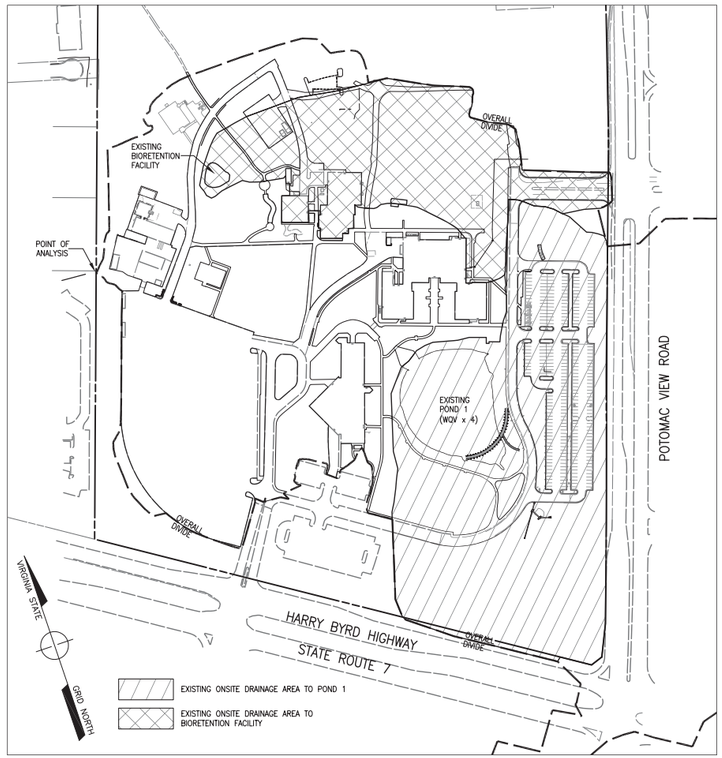
BCOM Project Code: 260-17377-001

DATE:	07.21.09
SCALE:	AS NOTED
EYP PROJECT NO.	1006106.01
DESIGNED BY:	DT
DRAWN BY:	DT
CHECKED BY:	K. ELLIS

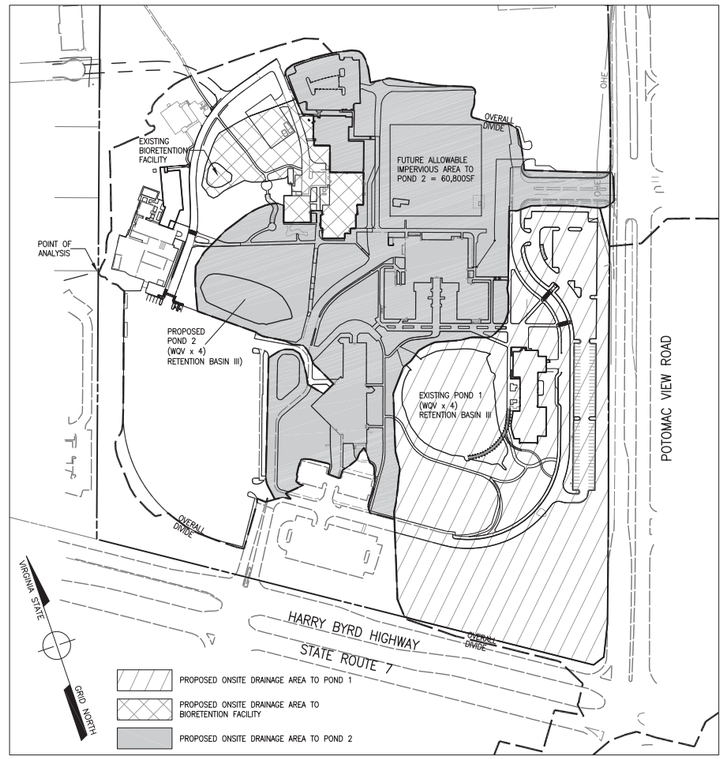
COMMONWEALTH OF VIRGINIA
KENNETH D. ELLIS
Lic No. 29582
PROFESSIONAL ENGINEER

BMP COMPUTATIONS

C-P503



NVCC LOUDOUN PRE-DEVELOPMENT IMPERVIOUS AREA


EXISTING BIORETENTION FACILITY
POINT OF ANALYSIS
OVERALL DIVIDE
FUTURE ALLOWABLE IMPERVIOUS AREA TO POND 2 = 60,800SF
PROPOSED POND 2 (WQV x 4) RETENTION BASIN III)
EXISTING POND 1 (WQV x 4) RETENTION BASIN III
POTOMAC VIEW ROAD
HARRY BYRD HIGHWAY
STATE ROUTE 7
VIRGINIA STATE
GRID NORTH
PROPOSED ONSITE DRAINAGE AREA TO POND 1
PROPOSED ONSITE DRAINAGE AREA TO BIORETENTION FACILITY
PROPOSED ONSITE DRAINAGE AREA TO POND 2

NVCC LOUDOUN POST-DEVELOPMENT IMPERVIOUS AREA

150 75 0 150 300 450

GRAPHICAL SCALE: 1" = 150'

BEST MANAGEMENT PRACTICE NARRATIVE

THE PROPOSED SITE DEVELOPMENT CONSISTS OF THE CONSTRUCTION ONE NEW BUILDING (LRC), AN ADDITION TO THE EXISTING SCIENCE BUILDING, AN ADDITION TO THE EXISTING VET. TECH. BUILDING, AND STORMWATER MANAGEMENT AND BMP FACILITIES ASSOCIATED WITH THE NEW CONSTRUCTION. SWM/BMP FOR THE PROPOSED DEVELOPMENT WILL BE INTREGRATED WITH THE EXISTING FACILITIES ON THE CAMPUS.

EXISTING BMP CONDITIONS
THE "NVCC LOUDOUN PRE-DEVELOPMENT IMPERVIOUS AREA" MAP ON THIS SHEET SHOWS THE ONSITE DRAINAGE DIVIDES THAT FLOW TO THE EXISTING BMP FACILITIES.

EXISTING POND 1 WAS DESIGNED BY PACIULLI SIMMONS & ASSOC. AS A STORMWATER MANAGEMENT/BMP FACILITY WITH THE PHASE II ACADEMIC BUILDING SITE PLAN DATED OCTOBER OF 1998. THE WET STORAGE VOLUME OF THE POND MORE THAN EXCEEDS THE 4 TIMES THE WATER QUALITY VOLUME REQUIRED FOR 65% POLLUTANT REMOVAL EFFICIENCY, PER THE ORIGINAL DESIGN. THE EXISTING POND WAS ALSO DESIGNED TO INCLUDE AN AQUATIC BENCH TO ENHANCE WATER QUALITY.

THE EXISTING BIORETENTION FACILITY WAS DESIGNED BY ADTEK ENGINEERS INC. AS A WATER QUALITY CONTROL FACILITY ON THE PHASE IIA SCIENCE BUILDING RENOVATION / ADDITION SITE PLAN DATED DECEMBER OF 2004. THE FACILITY WAS SIZED TO TREAT 76,719 SF OF IMPERVIOUS AREA. THE FIRST HALF INCH OF RUN-OFF x 4 (4 x WQV) WAS DESIGNED TO BE TREATED IN THIS FACILITY, THEREFORE, A 65% REMOVAL EFFICIENCY WAS USED.

THE PRE-DEVELOPMENT POLLUTANT REMOVAL LOADS FOR THE SITE SHOWN ON THIS SHEET TAKE INTO ACCOUNT THE ABOVE DESIGN CRITERIA.

PROPOSED BMP CONDITIONS
THE "NVCC LOUDOUN POST-DEVELOPMENT IMPERVIOUS AREA" MAP ON THIS SHEET SHOWS THE ONSITE DRAINAGE DIVIDES THAT FLOW TO THE PROPOSED BMP FACILITIES.

EXISTING POND 1 HAS AN AVAILABLE WET STORAGE VOLUME OF 316,937 CF, AS SHOWN THE "POND 1 WATER QUALITY VOLUME" TABLE ON THIS SHEET. THIS VOLUME IS TAKEN FROM THE PROPOSED WET POND GRADES FROM THE PHASE II SITE PLAN.

THE PROPOSED IMPERVIOUS AREA ONSITE DRAINING TO POND 1 = 149,535 SF.

149,535 SF x 0.042 FT (1/2-INCH) = 6,280 CF WQV

WQV x 4 = 25,120 CF < 316,937 CF AVAILABLE

POND 2, WHICH IS PROPOSED WITH THIS PLAN, WILL HAVE A PERMANENT POOL TO CONTROL WATER QUALITY. THIS REQUIRES 4 x WQV PLUS AN AQUATIC BENCH AND A SEDIMENT FOREBAY TO ACHIEVE A 65% REMOVAL EFFICIENCY.

THE PROPOSED IMPERVIOUS AREA ONSITE DRAINING TO POND 2 = 223483 SF.
ALLOWABLE FUTURE CONSTRUCTION OF IMPERVIOUS AREA WITHIN POND 2 DIVIDE = 60,800 SF.

284,283 SF x 0.042 FT (1/2-INCH) = 11,940 CF WQV

WQV x 4 = 47,760 CF WQV REQUIRED

WQV PROVIDED = 51,471 CF

THE EXISTING BIORETENTION FACILITY WILL BE UTILIZED FOR THE PROPOSED DEVELOPMENT. THE CONTRIBUTING DRAINAGE AREA TO THE FACILITY WITH PROPOSED CONDITIONS IS SIGNIFICANTLY LESS THAN EXISTING CONDITIONS.

THE ACTUAL SURFACE AREA OF THE FACILITY AS INDICATED BY SURVEY INFORMATION IS 3,230 SF. IF THE BIORETENTION FACILITY IS SIZED BASED ON 5% OF THE IMPERVIOUS AREA DRAINING TO IT, THEN THE ALLOWABLE IMPERVIOUS AREA CAN BE CALCULATED AS FOLLOWS:

3230 SF / 0.05 (5%) = 64,600 SF

ACTUAL IMPERVIOUS AREA TO FACILITY = 41,965 SF < 64,600 SF

BEST MANAGEMENT PRACTICE COMPUTATIONS

PERFORMANCE BASED WATER QUALITY CALCULATION PROCEDURE
(FROM THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK)

STEP 1: DETERMINE THE APPLICABLE AREA (A) AND THE POST DEVELOPED IMPERVIOUS COVER (Ipost).

THE APPLICABLE AREA (PLANNING AREA) WAS ESTABLISHED BY THE OVERALL ONSITE DRAINAGE DIVIDE TO THE POINT OF ANALYSIS AT THE OUTFALL OF THE SITE. THE AREA OF THIS DRAINAGE DIVIDE IS 38.73 ACRES.

PROPOSED CONDITIONS:
THE PROPOSED CONDITIONS CONSIST OF IMPERVIOUS AREA ADDED DUE CONSTRUCTION PROPOSED WITH THIS PLAN INCLUDING THE LEARNING RESOURCE CENTER, THE SCIENCE BUILDING ADDITION, THE VET. TECH. BUILDING ADDITION, AND THEIR RESPECTIVE HARDSCAPED AREAS.

THE COMBINATION OF EXISTING BUILDINGS, PARKING AREAS, ROADS, AND THE PROPOSED IMPERVIOUS AREAS RESULT IN A PROPOSED IMPERVIOUS AREA OF 40.7%.

STEP 2: DETERMINE THE EXISTING IMPERVIOUS COVER (Iexisting) OR USE THE AVERAGE LAND COVER CONDITION (Iwatershed).

EXISTING CONDITIONS:
PERCENT IMPERVIOUS 37.4%

AVERAGE LAND COVER 16%
CONDITION (LOUDOUN COUNTY)

STEP 3: DETERMINE THE APPROPRIATE DEVELOPMENT SITUATION.

DEVELOPMENT ON THE NVCC LOUDOUN CAMPUS SITE IS MOST RELATED TO SITUATION 4, WHERE THE EXISTING PERCENT IMPERVIOUS COVER IS SERVED BY EXISTING BMP FACILITIES.

REQUIREMENT: THE POLLUTANT DISCHARGE AFTER DEVELOPMENT (Lpost) SHALL NOT EXCEED THE EXISTING POLLUTANT DISCHARGE BASED ON THE EXISTING PERCENT IMPERVIOUS COVER WHILE SERVED BY THE EXISTING BMP (Lpre(existingBMP)).

STEP 4: DETERMINE THE RELATIVE PRE-DEVELOPMENT POLLUTANT LOAD (Lpre).

PRE-DEVELOPMENT POLLUTANT LOAD = (Lpre)

Lpre(existing)= [0.05+(0.009 x I(existing))] x A x 2.28
I(existing)= 37.4%
A = 38.73 ACRES

Lpre(existing)= 34.1 LBS/YR

Lpre(BMPbioretention)= [0.05+(0.009 x Ipre(BMPbioretention))] x A x 2.28
Ipre(BMPbioretention)= 25.2%
A = 6.8 ACRES

Lpre(BMPbioretention)= 4.3 LBS/YR

Lremoved(BMPbioretention) = Lpre(BMPbioretention) X EFF(BMPbioretention)
EFF(BMPbioretention) = 65%
Lremoved(BMPbioretention) = 2.8 LBS/YR REMOVED

Lpre(BMPpond1)= [0.05+(0.009 x Ipre(BMPpond1))] x A x 2.28
Ipre(BMPpond)= 24.9%
A = 12.83 ACRES

Lpre(BMPpond1)= 8.0 LBS/YR

Lremoved(BMPpond1) = Lpre(BMPpond1) X EFF(BMPpond1)
EFF(BMPpond1) = 65%
Lremoved(BMPpond1) = 5.2 LBS/YR REMOVED

Lpre(existingBMP) = Lpre(existing) - (Lremoved(BMPbioretention) + Lremoved(BMPpond1))

Lpre(existingBMP) = 26.1 LBS/YR

BEST MANAGEMENT PRACTICE COMPUTATIONS (CONT.)

STEP 5: DETERMINE THE RELATIVE POST-DEVELOPMENT POLLUTANT LOAD L(post).

THE POST-DEVELOPMENT POLLUTANT LOAD IS CALCULATED BASED ON THE PROPOSED IMPERVIOUS COVER.

I(post) = 40.7% (PERCENT IMPERVIOUS OVER 38.73 ACRES DRAINAGE DIVIDE)
L(post) = [0.05+(0.009 x I(post))] x A x 2.28
I(post)= 40.7%
A = 38.73 ACRES

L(post) = 36.8 LBS/YR

STEP 6: DETERMINE THE RELATIVE POLLUTANT REMOVAL REQUIREMENT (RR).

THE POLLUTANT REMOVAL REQUIREMENT (RR) IS DEFINED AS THE RELATIVE AMOUNT OF THE KEYSTONE POLLUTANT (IN POUNDS PER YEAR) WHICH MUST BE REMOVED BY A BMP.

SITUATION 4 = RR = L(post) - Lpre(existingBMP)

RR = 36.8 - 26.1 = 10.7 LBS/YR

STEP 7: IDENTIFY BEST MANAGEMENT PRACTICE (BMP) OPTIONS FOR THE SITE.

BMP CREDIT FOR PROPOSED CONDITIONS ON THE SITE WILL BE TAKEN FROM 2 EXISTING FACILITIES, AS WELL AS 1 PROPOSED FACILITY. THE WATERSHEDS FLOWING TO POND 1 & POND 2 ARE SHOWN ABOVE ON THE "NVCC LOUDOUN POST-DEVELOPMENT IMPERVIOUS AREA" MAP. THE AREA DRAINING TO THE EXISTING BIORETENTION FACILITY ALSO CHANGES WITH THE FUTURE BUILDING ADDITIONS. THESE NEW DRAINAGE AREA CHARACTERISTICS ARE SHOWN IN THE POLLUTANT REMOVAL CALCULATIONS SHOWN BELOW.

L(BMPpond2)= [0.05+(0.009 x Ipost(BMPpond2))] x A x 2.28
Ipost(BMPpond2)= 37.1%
A = 13.82 ACRES

L(BMPpond2)= 12.1 LBS/YR

Lremoved(BMPpond2) = L(BMPpond2) X EFF(BMPpond2)
EFF(BMPpond2) = 65%
Lremoved(BMPpond2) = 7.9 LBS/YR REMOVED

Lpost(BMPpond1)= [0.05+(0.009 x Ipost(BMPpond1))] x A x 2.28
Ipost(BMPpond)= 26.7%
A = 12.84 ACRES

Lpost(BMPpond1)= 8.5 LBS/YR

Lremoved(BMPpond1) = Lpost(BMPpond1) X EFF(BMPpond1)
EFF(BMPpond1) = 65%
Lremoved(BMPpond1) = 5.5 LBS/YR REMOVED

Lpost(BMPbioretention)= [0.05+(0.009 x Ipost(BMPbioretention))] x A x 2.28
Ipost(BMPbioretention)= 50.0%
A = 1.93 ACRES

Lpost(BMPbioretention)= 2.2 LBS/YR

Lremoved(BMPbioretention) = Lpost(BMPbioretention) X EFF(BMPbioretention)
EFF(BMPbioretention) = 65%
Lremoved(BMPbioretention) = 1.4 LBS/YR REMOVED

LremovedTotal = Lremoved(BMPpond2) + Lremoved(BMPpond1) + Lremoved(BMPbioretention)
LremovedTotal = 7.9 + 5.5 + 1.4 = 14.8 LBS/YR REMOVED TOTAL

RR = 10.5 LBS/YR < LremovedTotal = 14.8 LBS/YR REMOVED TOTAL

THEREFORE POLLUTANT REMOVAL REQUIREMENTS HAVE BEEN MET.

POND 1 WATER QUALITY VOLUME

EXISTING POND WET VOLUME (PER PLAN)

Elevation FT.	Area sq. ft.	Average Area sq. ft.	Depth f	Incr. Vol. cf	Cum Vol. cf
322	28856				
		31082.5	2.00	62165	62165
324	33309				
		35650	2.00	71300	133465
326	37991				
		40460.5	2.00	80921	214386
328	42930				
		51275.5	2.00	102551	316937
330	59621				

POND 2 WATER QUALITY VOLUME

PROPOSED POND 2 WQV PROVIDED

Elevation FT.	Area sq. ft.	Average Area sq. ft.	Depth f	Incr. Vol. cf	Cum Vol. cf
310	8642				
		9530.5	1.00	9531	9531
311	10419				
		11368.5	1.00	11369	20899
312	12318				
		13325	1.00	13325	34224
313	14332				
		17246.5	1.00	17247	51471
314	20161				

PROPOSED POND 2 SEDIMENT FOREBAY PROVIDED

Elevation FT.	Area sq. ft.	Average Area sq. ft.	Depth f	Incr. Vol. cf	Cum Vol. cf
310	1244				
		1521	1.00	1521	1521
311	1798				
		2106	1.00	2106	3627
312	2414				
		2751	1.00	2751	6378
313	3088				

POND 2 SEDIMENT FOREBAY REQUIRED VOLUME

IMPERVIOUS AREA DRAINING TO SEDIMENT FOREBAY FROM POND 2 DRAINAGE DIVIDE (INCLUDING FUTURE ALLOWABLE 60,200 SF OF IMPERVIOUS AREA) = 284,283 SQUARE FEET

284,283 SF * 0.0208 FT (0.25 INCHES / IMPERVIOUS ACRE) = 5,913 CUBIC FEET REQUIRED < 6,378 CF PROVIDED

SURFACE AREA POOL DEPTH RELATIONSHIP

BMP	POOL DEPTH (ft.)	SURFACE AREA (% OF TOTAL BMP SURFACE AREA)
POND 2 (RETENTION BASIN)	0 - 1.5	29.8%
	1.5 - 2	10.0%
	2 - 6	60.2%

Elsbeen Yaffe Prescott
Architecture & Engineering, P.C.
1000 Potomac Street NW
Washington, DC 20007
Telephone: 202.471.5000
Fax: 202.471.5050

eypae.com

EYP/

CONSULTANTS:

CIVIL ENGINEERING · SURVEY · LANDSCAPE ARCHITECTURE · LAND PLANNING · SITE SECURITY CONSULTING · GIS
William H. Gordon Associates, Inc.
4501 Daly Drive · Chantilly, Virginia 20151
(703) 263-1900 · METRO (703) 803-9508 · FAX (703) 263-0766

GENERAL NOTES:

KEY PLAN:

NO.	REVISION/SUBMISSION	DATE
	RECORD DRAWINGS	11.01.2012

NORTHERN VIRGINIA COMMUNITY COLLEGE LOUDOUN PHASE III

Loudoun Campus
1000 Harry Flood Byrd Highway
Sterling, VA 20164

BCOM Project Code: 260-17377-002

DATE:	2.11.2010
SCALE:	AS NOTED
EYP PROJECT NO.	1006106.01
DESIGNED BY:	RAB
DRAWN BY:	
CHECKED BY:	JDK

COMMONWEALTH OF VIRGINIA
KENNETH D. ELLIS III
Lic No. 29582
PROFESSIONAL ENGINEER

BMP COMPUTATIONS

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